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NIMONIC 105	7	940°C	**50**

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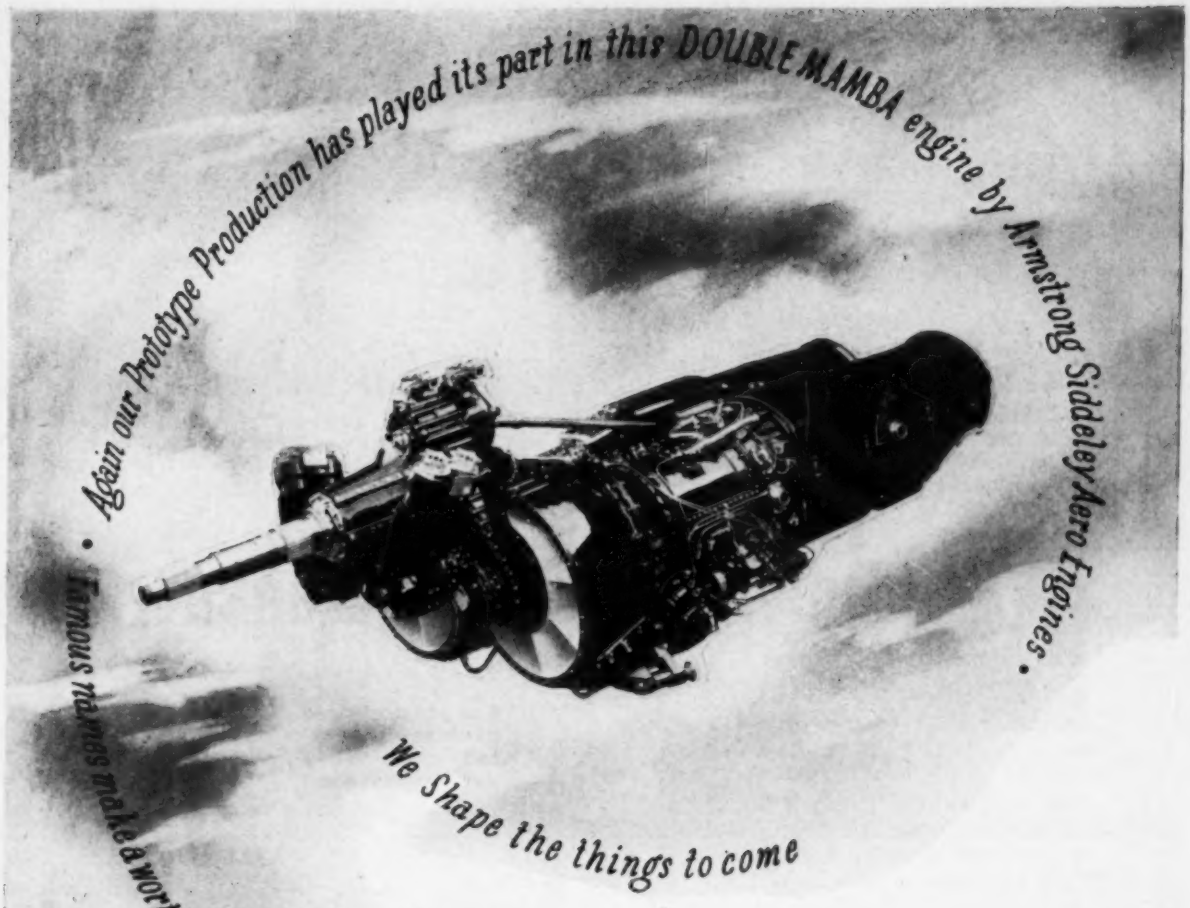
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2. Fuel from 6000-gallon auxiliary tanks inside the HERCULES' cargo compartment is pumped through wing-attached hose-reels and drogues—to fuel-hungry jet fighters.

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THE LOCKHEED C-130 HERCULES has been rewriting the record books ever since it entered service for the United States Air Force in December, 1956.

62 tons big, 6 miles-a-minute fast, this versatile prop-jet sky giant has made front-page news across the world with its feats of speed, strength, endurance and versatility—a few of which are described at right.

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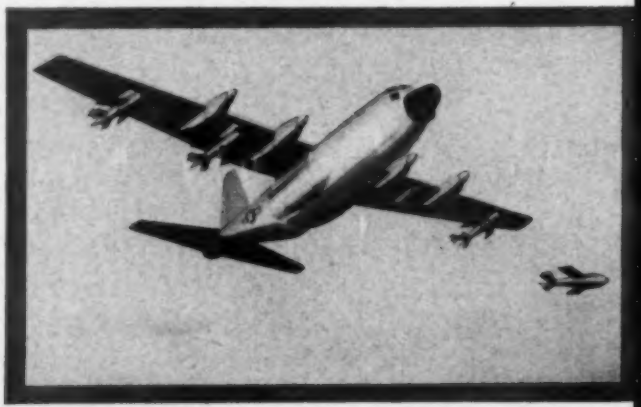
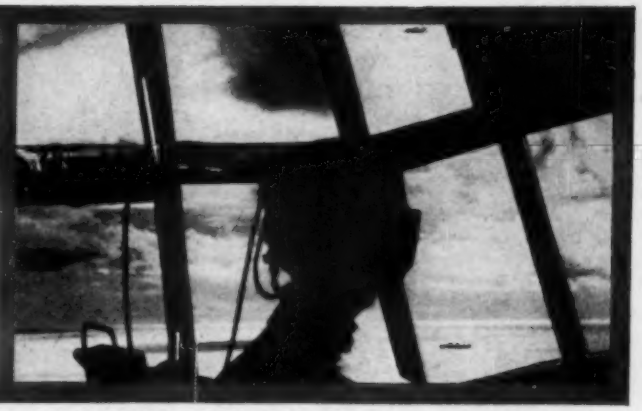
8. "Universal drone launcher" version of versatile HERCULES will carry drones under wing, launch them to afford target practice for high-speed missiles.



3. Zooming off from a frozen lake bed, a "Ski-130" breaks all records. Weighing 62 tons gross, it was airborne in only ? 100 feet; landed and stopped in 1,200 feet.

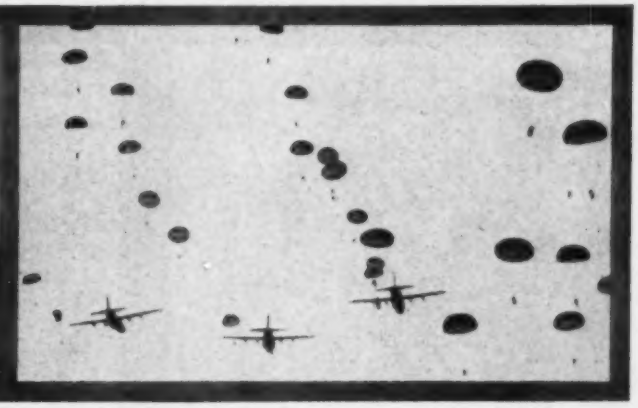


4. The U. S. Coast Guard will use HERCULES for long-range search and rescue operations. For extreme fuel economy, it flies easily on half power, has crossed country on only two engines.

perform all these FEATS OF HERCULES

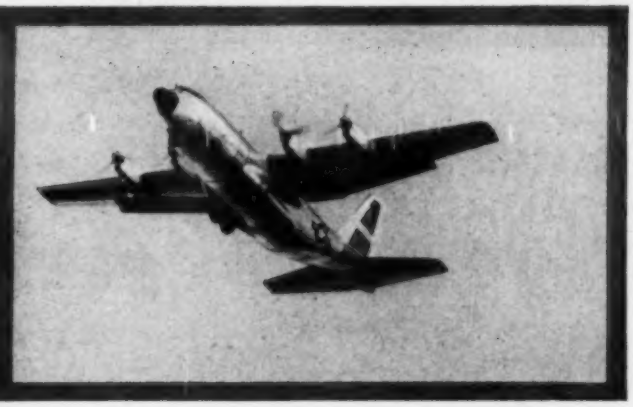
6. At Eglin Air Force Base, Florida, the C-130 HERCULES (weighing 110,000 pounds) landed on sand and stopped in 947 feet. Take-off from sand, with same load, averaged only 1500 feet.

7. From each HERCULES, 64 combat-ready paratroops bail out in seconds. C-130 also paradrops massive combat equipment. It holds record for heaviest chute-extracted drop: 30,370 lbs.



9. After a recent command decision a HERCULES airlift started moving 500 troops and 210,000 pounds of gear from U. S. base to Puerto Rico immediately. *13 hours later, mission accomplished!*

10. Most versatile jet-age sky giant, the C-130 is operational with USAF's Tactical Air Command . . . will soon serve Coast Guard, Marine Corps and the Royal Australian Air Force.



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Research into this is continuous. Operating speeds, loads and temperatures are steadily rising and every week brings fresh problems for solution. Aircraft and guided missiles are the obvious—but by no means the only—instances. Speaking generally we recommend lubrication by oil flood or vapour mist for the very highest speeds. We have built-up extensive data on this and allied problems. If you get in touch with our Technical Department they'll be only too glad to talk lubrication with you.

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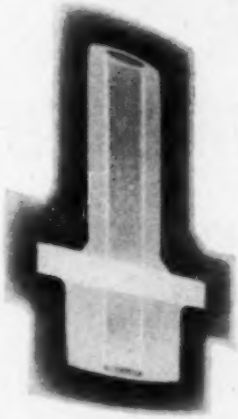

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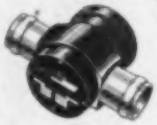

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* See page 34 for answer.

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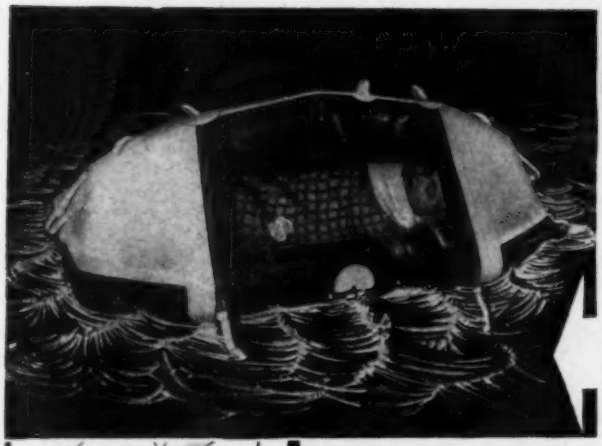

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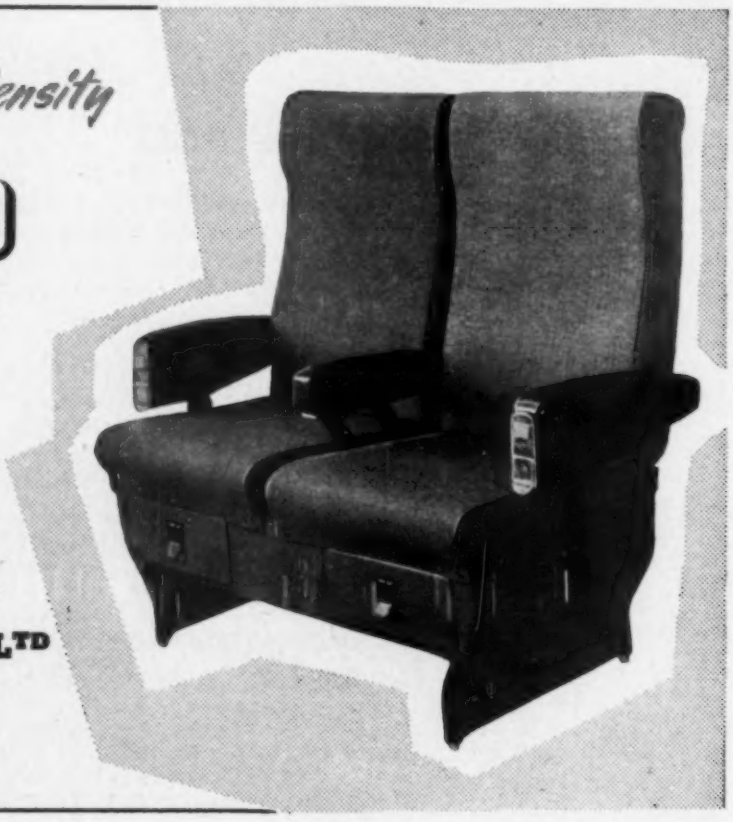

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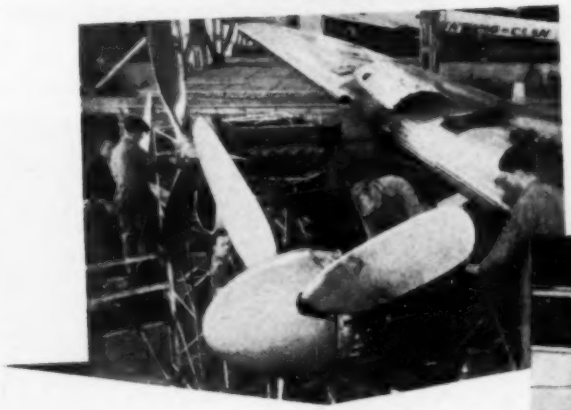

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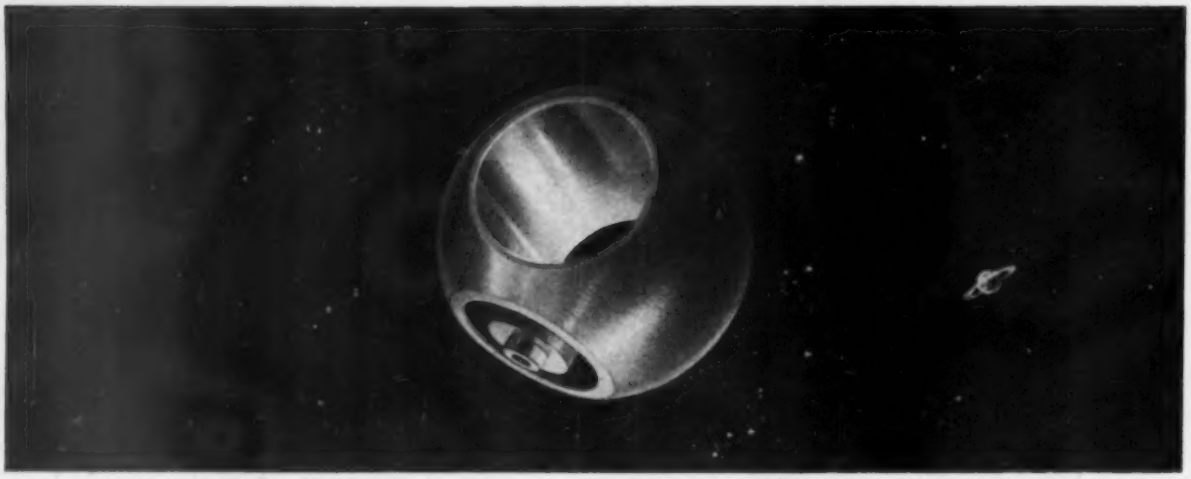

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FIRST AERONAUTICAL WEEKLY IN THE WORLD FOUNDED 1909

FLIGHT
and
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C

Jet Speedbird Inaugural

IT is not often that British Prime Ministers appear in public to wish commercial undertakings well. But Mr. Macmillan has done this twice in the last fortnight: once to inaugurate Rolls-Royce's new high-altitude test plant, and again—on television last Friday—to salute the de Havilland Comet 4 on the eve of its return to public service. His words on this occasion appropriately expressed the nation's pride in a "great story of British engineering quality, pluck, and perseverance."

While it may be true that international air commerce suffers, rather than gains, from nationalism, there is no disputing the fact that the Prime Minister's sentiments were appropriate. Even if B.O.A.C. had wanted to introduce their new aircraft with the minimum of fuss, they would have not been able to do so. The Comet has always had the most profound effect on the national emotions, to the extent that its sponsors' chief problem has often been to keep publicity under control. The fact that the Comet's re-entry into service was spiced by the challenge of American jet competition did not make this problem any easier.

There were moments when many people, mindful that haste in aviation is not always compatible with safety, felt that the Comet and all that it stands for were driving B.O.A.C. against their better judgment into a race with Pan American. But B.O.A.C.'s crews were jet-trained to a high pitch, de Havilland had delivered three aircraft several weeks ahead of schedule, and the Corporation was ready to go. By their brilliant, surprising two-way transatlantic "inaugural" last Saturday, B.O.A.C. made sure of two things: their traffic, and their claim—which, as Pan American know, means a great deal commercially as well as nationally—to have made history.

Croydon Demands Reconsideration

PARTICULARLY appropriate in an issue reviewing business and touring flying throughout the world is a close scrutiny of the picture in this country—and especially near London, where the city's most-used business and touring airport is scheduled to be closed down by Ministerial edict on December 31.

While Croydon Airport has been under sentence for the last five years, it is only since details of proposed alternative accommodation have been revealed (see *Flight*, October 3, p. 541) that real alarm has been felt. The Air Ministry's terms are such that there must be doubt that they were ever intended to be considered seriously. But the alternative can only be the implication that the Air Ministry, through the agency of the M.T.C.A., is deliberately trying to put private flying in the vicinity of London out of business.

It is hardly credible that a major airport in this country should be destroyed by the deliberate action of a Ministry legally committed to furthering the development of civil aviation. When that airport is the only general-use aerodrome serving the capital city of the United Kingdom the action becomes not merely incredible but downright negligent. The Croydon decision *must* be reconsidered.

Reconsideration is imperative not only because terms offered for occupancy and operation of Biggin Hill are financially and operationally crippling (and they most certainly are) but because conditions have demonstrably changed since the original decision was made. Senior M.T.C.A. officials, the London Chamber of Commerce and the Croydon Chamber of Commerce are among those who believe that the decision taken is the wrong one; and generous approbation would be accorded to a Ministerial recognition, however tardy, that in 1959 and for many years afterwards Croydon must serve a very different purpose from that envisaged in 1953.

It was emphasized in *Flight* just over a year ago that the closure "is not execution as the result of a process of natural evolution. It is economic murder, committed for the most tragic reason of all—failure to appreciate that the victim had not only the right, but ample justification for survival. Not because of the airport's historic associations, great as they are, but because Croydon is an essential London airport." The need for a business airport is imperative. Croydon has unique and continuing claims.

FROM ALL QUARTERS

Farnborough and Exports

ANTICIPATING, no doubt, the usual October crop of "No Farnborough next year" rumours, the S.B.A.C. announced last week that the 1959 Show will be held in the first full week of September. The Society added that its council had "noted with satisfaction" that at this year's event there were more overseas guests than ever before and that the number of exhibitors was a record.

British aviation exports just prior to the Show—the August figures, just announced—stood at £14,442,549—the third highest monthly figure ever achieved. Of this total, aircraft and parts accounted for £9,883,835 and engines for £4,130,402. Sales of electrical equipment amounted to £229,667 and those of aeronautical instruments and tyres to £146,955 and £51,690 respectively. Leading customers for August were the U.S. (£2,438,343 worth of aircraft and parts), Western Germany (£2,406,474) and Canada (£1,163,879).

Formosa Build-up

DETAILS have been given by the U.S.A.F. of the "composite" air force deployed in the Far East since the Formosa crisis began. It consists of one squadron of F-104s; two of F-100Ds; one of F-101s; one of RF-101s; one of B-57s; two of C-130s; and one of K-50s. The force, which was deployed "in a matter of hours" from eight bases in the U.S., is separate from other U.S.A.F. and U.S.N. aircraft operating in the area.

HUGH MEREWETHER, Hawker test pilot, flew a Hunter F.6 from Dunsfold to Tobruk, 1,819 st. miles, in 3 hr 19 min (548 m.p.h.) on October 2. The flight will rank not as a record, but as a "certified performance."

Marconi Military Radars

SOME 600 NATO, Commonwealth and civil aviation representatives last week saw a major demonstration of Marconi land and sea defence radar systems at Rivenhall, near Chelmsford.

Particularly significant was a new range of ground defence equipment based on integrated S- and L-band high-power radars using back-to-back scanners on a single mounting. Logarithmic receivers with pulse-length discrimination and coherent M.T.I. present both radar pictures on a single tube. Fixed-coil display allows maximum use of symbols for rate-aided tracking and display of map and fixed-marker information. Target vectors can be fed to a digital store now being developed. Combined with this system, which was shown operated by a supervisor and trackers, is the new 3MW nodding, S-band height-finder capable of taking 15 heights per minute and displaying them in sequence with neon digits at the relevant operators' consoles. If a search sector is being jammed, the height-finder can be set to scan above and below the origin of jamming, the picture being integrated to fill the gap in the main P.P.I. display. Additional B- and A-scopes can be used to expand and separate out individual aircraft in a formation and markers can be used to point out any one of them to an operator on another scope. Closed-circuit TV displays fighter "tote" boards at the supervisor's console.

Much of the equipment at Rivenhall, never before publicly shown, has particular significance in both defence and air-traffic control operations. An alternative transmitter for the height finder is made by the French C.S.F. company.

HEIGHT-FINDERS: First right, a Saunders-Roe Black Knight high-altitude vehicle being hoisted into a rig at High Down, I.o.W. The bull's-eye scored by the first round fired at Woomera was due largely to exhaustive testing here of the vehicle and its four-chamber Armstrong Siddeley motor (more details next week). Second right, Marconi's new radar height-finder (news item above).

LIGHT RESCUE: A nuclear-war casualty exercise held by the R.A.M.C. near Aldershot last Friday made extensive use of helicopters. The Fairey Ultra-light, flown by Peter Twiss, performed in the ambulance rôle, and the Rotodyne also appeared; noting that it could carry 48 wounded men, a senior officer described it as "very much the aircraft of our future." The Rotodyne landed on a nearby parade-ground.

U.S. RECOGNITION of British achievement: two R.N. officers and three British civilians were recipients of high honours at the U.S. Embassy, London, last Friday, for their aircraft-carrier developments. L. to r., Rear Admiral D. R. F. Cambell, D.S.C., Legion of Merit (co-inventor, angled deck); Cdr. H. C. N. Goodhart, Legion of Merit and Mr. D. Lean, Medal of Freedom (co-inventors, mirror sight); Mr. C. C. Mitchell, O.B.E., Medal of Freedom (inventor, steam catapult); Mr. L. Boddington, C.B.E., Medal of Freedom (co-inventor, angled deck); and the U.S. Ambassador in London, Mr. John Hay Whitney.

IN BRIEF

Following the recent merger agreement between the Dutch and Belgian Air Forces, and the joint plan to train their pilots in the Belgian Congo, the Belgian Air Force has ordered 45 Fouga 170 Magisters.

* * *

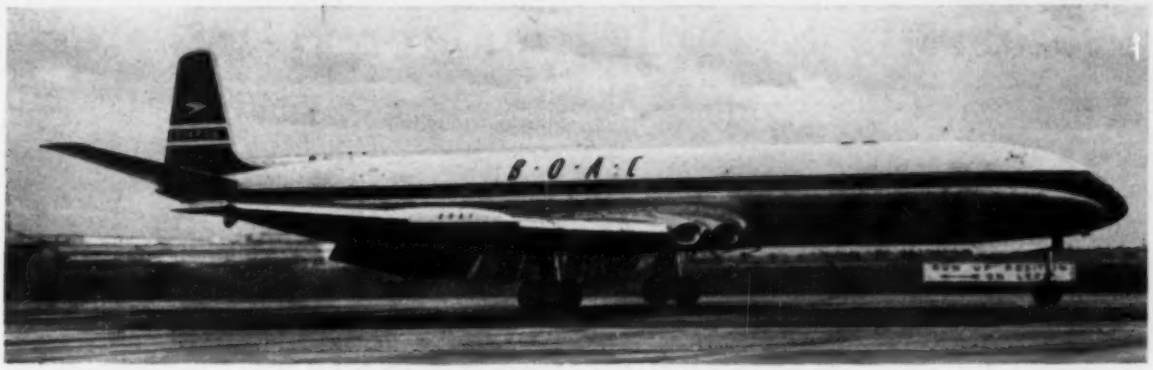
Nineteen Migs (mark unspecified) flew over Baghdad from Habbaniyah on October 1. They bore United Arab Republic markings and a radio announcement said that they were to strengthen the Iraqi Air Force.

* * *

Donald W. Douglas, founder and chief executive officer of the Douglas Aircraft Company, is to receive the Franklin Medal, highest award of the Franklin Institute, on October 15 in recognition of "his creative engineering in the field of aeronautical design as exemplified in all his work, but particularly in the DC series of transport airplanes . . ."

* * *

A new department, devoted to aircraft materials, has been established at the College of Aeronautics, Cranfield, in order that students of the two-year postgraduate diploma course may read this subject as their main specialization. Advanced short courses in materials for external industry personnel are also envisaged. Head of the department is Prof. A. J. Kennedy, B.Sc., Ph.D., A.M.I.E.E., F.Inst.P.



After a record crossing from New York, G-APDB lands at London to complete the first transatlantic jet service.

By Comet 4 to New York

THIS is a first-hand account, by a special correspondent, of the pre-inaugural proving flight to New York made by B.O.A.C. Comet 4 G-APDB. On page 602 appears "Diary of a Fast-moving Week," Roger Bacon comments on page 605, and a leading article is on page 569.

WE should have had the intelligence to realize that something was very much up, from the curious title of the flight ("Pre-inaugural proving") and the manner in which Freddie Gillman and his B.O.A.C. public-relations staff were searching desperately for us twelve hours before take-off. Again, when we heard vague hints at London Airport on that Thursday morning that menus had already been printed for the first commercial flight London - New York and dated Saturday, October 4, we should have collected our wits and realized that the undercover battle between P.A.A. and B.O.A.C. was as good as won.

There, in the crowded little Monarch lounge on the North Side, were B.O.A.C. managing director Basil Smallpeice and D.H. managing director Aubrey Burke—both booked to fly with us to New York on flight CPF 001. More evidence that this was not just a Press jolly. But there was no official comment from anyone.

It took us something like five-and-a-half hours between London and Gander to discover that Comet 4 G-APDB would be one of the winners in the biggest aviation Autumn Double yet. By the time we had landed at Gander it was clear from the carefully worded phrases of every B.O.A.C. man aboard—including the managing director—that it needed only the final clearance from the Port of New York Authority (and a clutch of fare-paying passengers to make it legal) for the first-ever pure-jet passenger service across the Atlantic to begin. So Gander's cable office had the biggest rush in its history as the national Press queued to get off their stories.

We had reported to Victoria at 0900, regarding with barely concealed sneers the peasantry about to fly in fan-propelled aeroplanes. But coach after coach left before we were called. We had coffee, wondered about the delay. Take-off, due at 1100, had been put back. Some small aileron snag, we gathered later, and a short test flight needed after it had been put right.

It was just before 1226 that we taxied out and just on 1230 when Captain Tom Stoney turned onto the runway and started rolling. Sixty seconds later we were over Windsor and climbing like a fighter. At 1246 we were over Filton. By the time we reached the Irish Sea we were at 32,000ft—ground speed 465 m.p.h. with a 20 kt headwind. We tried to get clearance to 36,000ft, but opposing traffic at 37,000 kept us down.

The traffic was a B-47 on its way to Britain. Over weather-ship *Juliet* (she reported seeing us) we were in good radio communication with Shannon, Gander and London. By that time the B-47 had been cleared down to 31,000ft and up we went to 35,000, waiting for clearance to 39,000. Tom Stoney gave our E.T.A. at Gander as 1800 hr (1430 Gander time). He was two minutes out. We finished lunch at 1530 B.S.T. Fifteen minutes later we were somewhere near weather-ship *Charlie*, 900 miles from Gander and 1,450 from London.

And Delta Bravo was going like a bomb. Gander we reached in 5 hr 28 min. We had flown 2,360 miles at an average speed of 430 m.p.h. Maximum height was 39,000ft, outside temperature −57 deg C.

Refuelling took us 1 hr and 17 min (45 min allowed as schedule). Gander was its usual dreary self and glad we were to get back into the Comet. But for the 1,140 miles to Idlewild we had to mix it with 115 m.p.h. headwinds, which brought our ground speed down to 335 m.p.h. So we took 3 hr 25 min for that last leg. The only incident on the flight was an unlucky accident to Peggy Thorne, one of our two stewardesses. Somebody had left an inspection hatch open in the forward galley and down she went, grazing a leg badly. But she was on her feet for that memorable return flight on Saturday.

For the 3,500 miles from London to New York our flying time was 8 hr 53 min—elapsed time, 10 hr 32 min. We arrived relaxed and exhilarated—and feeling very patriotic.

Off we went to our hotel—the new International at Idlewild; and very good it is, too. Mr. Smallpeice dated us for lunch next day, promised to tell us what he could about the talks. We went to bed after carving a neat little 707 out of our cake of courtesy soap and sticking pins in it.

Sure enough, next day Mr. Smallpeice promised a statement at 7.30 p.m. But there was victory in the air and I'm certain that not a single British newspaperman had failed to file, hours before, a story giving the news of the Autumn Double as hard as he could. And somehow they got hold of the name of a U.S. businessman who'd booked his seat way back in 1952.

It was an enthusiastic crowd of B.O.A.C. men and women—British and American—who gathered in the Speedbird Club in B.O.A.C.'s new Fifth Avenue offices that evening. And when the managing director announced that Idlewild had given the go-ahead to jetliners the bar steadily began to run out of beer.

Here are the rules laid down for pure-jet operation in general:—

(1) When weather and winds permit, jets must take-off from runways 25 and 22, which face south-west and take aircraft over Jamaica Bay during initial climb.
(2) If they can't take-off over water, runways 13 Right, 31 Left and 7 may be used so long as turns are made as soon as possible away from communities and the minimum altitude over any community is 1,200ft. Power must be cut back before reaching the first populated area.
(3) No other runways may be used without prior permission.
(4) Take-offs between 2200 hr and 0700 hr must be confined to the two runways leading over the water.

Pan American at once objected to these rules. Said the airline, in effect: "They mean preferential treatment for the Comet." And it was suggested that B.O.A.C.'s initial Comet passenger crossings would be merely "token flights." Mr. Smallpeice then went on record as saying that "Any suggestions that conditions are not reasonable are not only without foundation but also show considerable lack of good sportsmanship."

Finally, it was interesting to see at London Airport—when we arrived back by Stratocruiser on Sunday morning—painter's ladders up against a big PanAm hoarding which was shouting something about "First Atlantic jet service."

Seen on board the "pre-inaugural" service are, left, Capt. Tom Stoney, Mr. Basil Smallpeice, Stewardess Barbara Jupp. Right, cockpit scene between Gander and New York, Capt. Stoney in the foreground.

Automatic Stabilization for Helicopters

THE major part of a lecture given before the Helicopter Association on October 3 consisted of an exceptionally informative description of the A.S.E. (automatic stabilization equipment) used in the Sikorsky HSS-1N helicopter. Entitled *All-weather Helicopter Systems*, the paper was by Walter Gerstenberger, chief of dynamics, Sikorsky Division of United Aircraft. After discussing basic considerations of bad-weather flying for military and civil helicopters, Mr. Gerstenberger turned to the HSS-1 and HSS-1N (U.S. Naval designations for the two versions of the S-58).

Two independent sets of powered controls were provided, he said, one operated by an engine-driven hydraulic pump, the other by a rotor-driven pump. D.C. power was furnished by engine-driven and rotor-driven generators, and A.C. was supplied by three inverters, so arranged to take full advantage of the redundancy to provide safe flight during emergencies.

Automatic stabilization had been in operation for several years on the HSS-1 and had proved a good solution to the problem of providing the pilot with a vehicle he could handle easily and without too much dependence upon external visual cues. It had a reliability of about one malfunction in 800 flight hours, and it was probable that this reliability could be at least doubled. There was little doubt that during the 801st hour the pilot could fly this helicopter on his instruments, without the A.S.E. equipment and at a speed above 40 knots, to a safe destination.

A.S.E. was developed by Sikorsky exclusively for helicopter use from fundamentals first conceived ten years ago. Describing its operation, Mr. Gerstenberger said that whilst the pilot must be the prime authority in the direction of his vehicle he needed help, in order that his mental and visual capabilities should not be saturated. A.S.E., which introduced stabilization signals without taxing the pilot with the details, was an example of this concept. It permitted certain functions which could be delegated to automatic control. By limiting the authority of the control to the point where it could still perform its task, yet leave the pilot inherently in full authority at all times (especially during emergencies) a fail-safe condition existed, in which 100 per cent reliability was not required for the aid. This might be contrasted to a control which could not be duplicated by the pilot, e.g., the fuel control of a turbine, where fuel management was so difficult and so closely related to the structural integrity of the turbine that it appeared more feasible to increase the reliability of the automatic control, or rely on several engines, than it is to allow the pilot to control the turbine manually.

Incorporation of additional features for improved limited-visibility flying in the HSS-1N preserved this concept of delegation of limited authority used in the HSS-1, but extended it to the rotor r.p.m. control in the form of a throttle governor and to the Doppler hover mode with the facility of automatic approach to the hover. The HSS-1N was an anti-submarine helicopter, and the additional facilities provided for round-the-clock operation. Here was an interesting example of a solution to the difficult problem of the approach-to-hover over water with sufficient accuracy to permit the sonar transducer to be lowered into the water without damage, all this being accomplished with no dependence on outside visual references. The results were from the combined efforts of the U.S. Navy's Bureau of Aeronautics, Naval Air Development Center, Naval Air Test Center, numerous electronic component manufacturers and Sikorsky Aircraft.

Apart from the automatic control equipment, the instrument panel [illustrated below—Ed] has been redesigned to provide additional information and integrated to provide for a more convenient scan pattern. To the left of the pilot's panel were all instruments for engine monitoring. When everything was normal, all needle positions were vertical. Underneath these were the switches for selection of alternative electrical power sources.

In front of the pilot and co-pilot were the basic flight instruments, and in the centre of this group were the essential instruments needed for going into hover from forward flight, all of them entirely new: the dual-purpose hover indicator, which showed Doppler ground speed or cable angle; the improved radar altimeter, with an expanded scale to show height above the surface to within two feet; and the remote attitude-indicator, with both roll and pitch-trim adjustments. Instruments for power monitoring were to the pilot's right.

The motor box was still at the back, between the pilots, but was now equipped with individual channel-disengagement switches so that any malfunctioning channel could be disconnected without cutting out A.S.E. completely.

The cyclic stick had been shortened to give a better view of the instrument panel, and a new, "beeper" trim-button now allowed the pilot to make small stick-feel corrections without losing his established reference. The redesigned grip contained all the familiar switches except the turn-button, which has been removed.

The collective-pitch stick had also been changed. The hoist switch was now on the collective, and did double duty as an emergency inter-phone control. The engine starter button served as a disengage-switch for the A.S.E. coupler once the engine was started.

As before, the A.S.E. panel provided engagement and disengagement for the A.S.E. pitch, roll and yaw; barometric altitude; automatic hovering using the sonar transducer cable as a reference; and hydrostatic altitude. It also provided for small heading-trims and corrections for fore-and-aft c.g. trim, and gave a null indication for the servomotor position. Controls were also provided for two new functions; automatic engine speed, and the seek-and-retain ground-referenced hover coupler. Adjacent was a switch to select between Doppler reference and cable reference and another switch to select between hydrostatic altitude or radar altitude.

The lecturer next recapitulated A.S.E. procedure in the earlier HSS-1. "When you engaged A.S.E.," he said, "you had pitch, roll and yaw stability. BAR ALT gave you altitude retention. After you lowered the sonar transducer you switched to ASW cable and ASW ALT for automatic hover over the cable. The conventional cyclic stick, without A.S.E., normally fed through mechanical linkage and a hydraulic servo to the rotor blades. A.S.E. input was introduced by an electric servo working through a differential link, to make small, limited-authority corrections through the hydraulic servo, to the blades. Electric servo input was derived from a comparison of signals from the vertical gyro and the stick-position senser. The resulting signal was then amplified and fed to the electric servo. Thus, in normal operation, the attitude of the helicopter was stabilized at an attitude determined by the pilot's stick position. The stick-centering spring was used in conjunction with a magnetic clutch. When the clutch was engaged, the spring provided stick-feel, and a referenced position, if the pilot removed his hand from the stick. Disengaging the clutch allowed the pilot to shift his reference.

"Another feature of the HSS-1 was the sonar coupler, which operated from a cable-angle senser. The senser induced a signal into the coupler which sent a command signal that was introduced into the A.S.E. to maintain the helicopter in position over the sonar transducer."

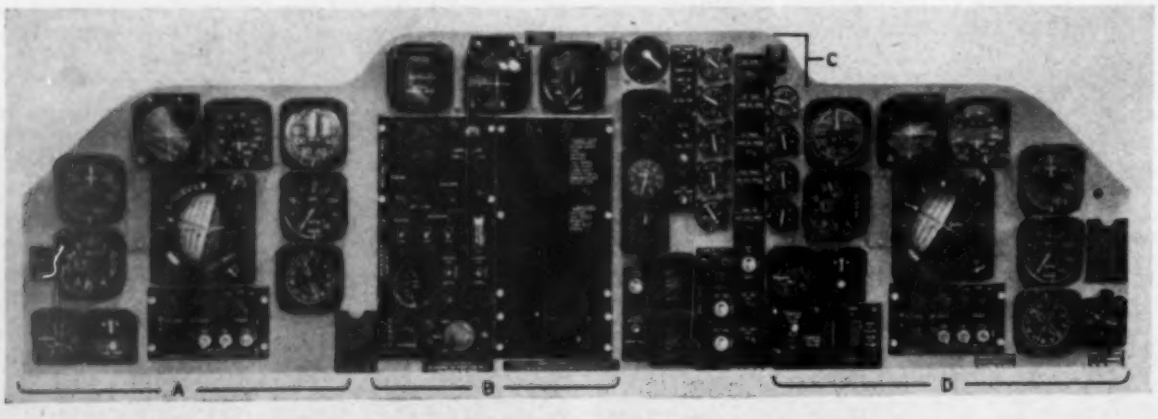
In the new HSS-1N, said Mr. Gerstenberger, important features had been added in the pitch-and-roll channel. A Doppler ground-speed system had been added and could be selected as the primary sensing for the coupler. The automatic control circuits of the coupler would bring the helicopter to a hover from any lateral or longitudinal flight condition. However, in order to make it possible for this control to work through the whole flight regime, it had been necessary to extend the automatic control authority beyond the limits provided by the servomotor input. The magnetic clutch had therefore been replaced by another actuator so that, when the coupler called for a signal in excess of what could be provided by the differential input, a signal was sent to this trim control to move the stick slowly in the proper direction; this maintained the automatic control within its limited authority. When the coupler was not engaged, the trim control could be used by the pilot to make small adjustments to the stick trim.

The altitude channel was basically the same as the pitch channel except that the pilot's control was the collective. Altitude errors were detected by a barometric senser, and the coupler was fed either by the hydrostatic depth-senser or by the expanded-scale radar altimeter. In order to accomplish the large power-changes necessary between forward flight and hover, a collective open-loop-and-balance spring was used across the hydraulic servo, in conjunction with a collective-stick position-senser, to adjust automatically the position of the pilot's control.

One of the most important additions to the HSS-1N was the Doppler ground-speed sensing equipment, actually a radar transmitter and receiver. As the Doppler beams struck the surface, the impulses were reflected back to the receiver-antenna on the helicopter. Any motion which existed between the helicopter and the reflecting surface, normal to the radar beam, would cause the received signal to undergo a frequency change. Frequency shifts were compared and longitudinal, lateral and vertical velocities computed. This information was fed to the coupler and the pilot's hovering indicators. In the coupler, they were combined with signals from the radar altimeter and other information to bring the helicopter from forward flight to hover at preselected altitude.

(*Concluded at foot of opposite page*)

The HSS-1N's instrument panel. A, co-pilot's flight instruments; B, navigation; C, powerplant and services; D, pilot's flight instruments.



The second Arrow undergoing engine runs—with noise suppressors—at Malton. A third has already flown.

THE ARROW STORY

—told by Avro Aircraft's Vice-President Engineering

THE history, characteristics and operation of the Avro Aircraft CF-105 Arrow all-weather intercepter were due to be discussed last night, October 9, by Mr. J. C. Floyd, A.M.C.T., P.Eng., F.R.Ae.S., F.C.A.I., M.I.A.S., vice-president, engineering, of Avro Aircraft, Ltd., in the 14th British Commonwealth Lecture before the Royal Aeronautical Society.

Mr. Floyd's paper—a model of its kind—contained a considerable amount of hitherto unpublished information. It quoted the Arrow's normal combat gross weight as 64,000 lb, and a drawing showed auxiliary fuel tanks carried beneath the fuselage.

On the fire-control system Mr. Floyd said: "While it is not possible, for security reasons, to describe the integrated electronic system which is the brain and nerve centre of the Arrow weapon system, I can say that it is a very sophisticated system and provides automatic flight control, airborne radar, telecommunications and navigation, and special instrumentation and pilot displays, and can operate in either fully automatic, semi-automatic or manual environment. The system is carried mainly in the radar nose, with missile auxiliaries housed in the armament bay."

The following extracts from pilots' reports were quoted: "The nosewheel can be lifted off by very gentle movement of stick at just over 120 kt." . . . "Unstick speed is about 170 kt A.S.I., with an aircraft attitude of about 11 deg." . . . "Acceleration is rapid, with negligible correction required, and no tendency to swing." . . . "Typical touchdown speed is a little over 165 kt (the normal landing procedure is to stream the drag chute on touchdown when the nosewheel has settled)." . . . "There was no indication of stalling at the maximum angle of attack at 15 deg." . . . "Stability steadily improved with speed." . . . "Change of trim was negligible except in the transonic region, where small changes of trim were required." . . . "No attention was required by the pilot to prevent over-controlling." . . . "In turns, stick force was moderate to light, but always positive with no tendency to pitch up or tighten." . . . "In sideslip, the aircraft was a little touchy without the damper, but excellent with damper switched on." . . . "In general, the handling characteristics and performance of the aircraft agreed well with estimates."

Having referred to the accident to the first Arrow (caused by an undercarriage failure) which put the aircraft out of commission for several months, Mr. Floyd went on to report that aircraft Nos. 2 and 3 had now taken over the bulk of the flight test programme and, in proving the flight envelope, had flown at speeds considerably in excess of those achieved by the first aircraft—which itself exceeded 1,000 m.p.h. early in its test programme.

After describing the Canadian evaluation procedure including trials at the Air Armament Evaluation Detachment at Cold Lake, Alberta, Mr. Floyd said, "With regard to our own flight testing, we have had the added problems of operating from a busy commercial airport adjacent to the plant and have to tie our flight testing in with scheduled commercial flights. However, with as many as 30 flights a day on the CF-100, we have had little problem with this, due to the excellent co-operation of D.o.T. controllers."

With recent Canadian defence decisions in mind (p. 538, *Flight*, October 3), there will be particular sympathy with Mr. Floyd in respect of his concluding paragraphs: "There were many periods of frustration, and in the early stages of the programme the project was on and off about every three months, while Government and the Service wrestled with the problems involved in managing and financing such a large project. When the programme finally got under way, and the engines scheduled for the project fell by the wayside one by one, we had to redesign our fuselage three or four times, and while the aircraft had been designed from the outset with the flexibility to make re-engining as simple as possible, it appeared to us that every engine manufacturer had gone out of his way to make things different . . .

"The R.C.A.F. naturally wanted the best and latest integrated electronic system and weapon in the aircraft, and finally chose these, after a considerable portion of the aircraft had been designed around an earlier system. This is, of course, normal to some extent in our business. However, since this is the major military project in Canada and involves almost all of the aircraft and associated industries, the whole Arrow programme is in the 'shop window' so to speak, and every setback becomes almost a national calamity. This can be quite embarrassing from an engineering point of view, especially superimposed upon the added pressures of attempting to meet what was probably the most advanced contemporary intercepter requirement.

"However, we have survived so far, and from the results of our flying to date, there is every reason to believe that Canada's biggest military venture will emerge from a state of national discussion to become a source of national pride and security, if such there can be in our peculiar but exciting time. To those of us in Canada who have been actively engaged in this project, this will be sufficient."

AUTOMATIC STABILIZATION FOR HELICOPTERS (continued from opposite page)

The other new feature of the HSS-1N was the automatic engine-speed control. Action of a conventional throttle-control on the collective-pitch stick was combined, in the differential adding mechanism, with a signal from the output of the collective hydraulic servo. This constituted mechanical-synchronising type of control, in which increases in power requirements from collective pitch stick motions anticipated the need for throttle increases, thereby preserving the configuration used in manually controlled throttle systems and reducing the work-load of an automatic control for engine speed. As with the other stabilized primary controls, the command signal for increased r.p.m. or power was introduced by the throttle grip, whether manual or automatic control was used. Changes in r.p.m. could be effected without the need to disengage the governor itself, and automatic control corrections were achieved without motion of the grip in the pilot's hand.

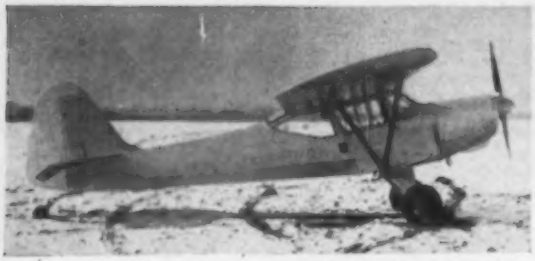
To make an automatic approach to the hover, the area was approached to within 100ft, where altitude was maintained with the help of the barometric control. When approximately 500 yd downwind of the hover point, and proceeding at about 40 kt, the pilot set his radar altimeter at, say, 50ft and engaged the hovering coupler, which then sought to null-out the forward and lateral drift velocities sensed by the Doppler system. The circuits were timed to give a uniform reduction in speed and altitude which would simulate the manual approach made by a cautious pilot during a visual approach.

The pilot could monitor this blind approach without movement of the controls, or he could alter it by manual inputs with no disengagement of any of the automatic facilities, or any override forces other than the normal stick trim forces which provided a small force gradient to the controls. Great effort had been made in the design of these automatic controls to render their operation similar to manual operations. The pilot had to learn the functions of new switches, knobs, and indicators, but he flew the helicopter in the same manner as previously.

The HSS-1N illustrated what could be done for a particular mission such as anti-submarine search with a helicopter, and the techniques and hardware used in this application of instrument flight could be used, with slight alterations, for other problems. A.S.E. had passed all the necessary C.A.A. tests, and hence could be used in airline service.

Business and Touring Aircraft

A "FLIGHT" INTERNATIONAL REVIEW OF CURRENT TYPES



Upper left, Auster Autocar; left, Auster Workmaster.

Above, Auster Agricola.

GREAT BRITAIN

Auster

Agricola Auster's low-wing Agricola follows a seventeen-year tradition of high-wing designs at Rearsby, and was developed primarily for top-dressing, crop-dusting and crop-spraying operations. Advantages claimed for the low-wing configuration include under-leaf spray penetration from wing downwash, ease of hopper filling, wide-track undercarriage, quick refuelling and simple installation of spraying gear. Simplicity in the airframe structure, external control-runs, and a two-seat cabin aft of the hopper trunk are among the design features of the aircraft, which is powered by a six-cylinder 240 h.p. Continental engine.

Aiglet Trainer Powered by a D.H. Gipsy Major 10 engine of 145 h.p., the J5L Aiglet Trainer is a fully aerobatic two-seater which has proved particularly suitable for elementary training at flying clubs and schools. The touring version of this machine has modified front seats and in addition a third bench-type seat fitted across the rear of the cabin.

Alpha This machine is the Auster company's "answer to the need for a really cheap light aircraft capable of working hard under strenuous climatic and operational conditions." Alternative powerplants, each offered "overhauled nil hours" and each of 130 h.p., are the Lycoming O-290 and the D.H. Gipsy Major 1. A feature of the Alpha is its versatility, a range of operational equipment enabling alternative duties such as glider and banner towing, ambulance work, aerial photography and float and ski operations to be carried out. Conversion kits are also available for agricultural work. Useful load in the Major-powered version is 806 lb.

Alpine Utilizing the fuselage of the Aiglet, the wings of the Autocar and additional modifications providing improved handling qualities and more comfortable seating for the pilots, the Alpine has as its main advantage the ability to operate from high-altitude airstrips in hot climates (by reason of its favourable power loading and large wing area). The 145 h.p. Gipsy Major 10 is the standard powerplant with the 130 h.p. Major 1 as an alternative.

Autocar Here again the D.H. Gipsy Majors 1 and 10 are alternative engines for this four-seat tourer. The higher-powered version has a higher cruising speed and a greater all-up weight, while in both versions a large cabin is incorporated and the wide range of applications already mentioned in connection with previous Auster types are possible.

Sprayer With the same dimensions and weights as the 145 h.p. Autocar, the Sprayer agricultural aircraft is now in use in many parts of the world. Its operations have included cotton-spraying in the Sudan and spraying locust swarms for the Food and Agricultural Organization of the United Nations in the Middle East. It has a spray tank of 48 Imp. gal capacity mounted in the cabin, with filler-neck on top of the fuselage, and the spray bars give an effective swath width of 45ft when the aircraft is flying at 5ft above the ground.

Workmaster Increased engine power and a larger capacity spray-tank are incorporated in the Workmaster, Auster's latest high-wing agricultural design. A Lycoming O-360-A provides 180 h.p. and the spray tank capacity is 100 Imp. gal, i.e., 120 U.S. gal. Maximum gross weight is increased also, to 2,655 lb. The spray tank is located alongside the pilot and its contents can be dumped in an emergency in under 5 seconds. A double-thickness windscreen gives resistance to in-flight impact by birds, and the strengthened pilot's seat has a 25g shoulder harness.

Auster Aircraft, Ltd., Rearsby Aerodrome, near Leicester.

Aviation Traders

Civil Prentice In March this year the first delivery was made of the civil touring version of the ex-military Percival Prentice, a large number of which have been acquired by Aviation Traders at Southend. Production of a total of 251 is planned. This four-seater is powered by a 240 h.p. D.H. Gipsy Queen 30-2 engine and has a normal flight endurance of 3 hr 30 min. Extra fuel and oil tanks can be fitted, at £200 more than the standard price of £1,825, giving a range of 700 n. miles and an endurance of 7 hr. A single-seat version with the standard fuel system is now available for banner-towing at a price of £1,650. Ambulance, target-towing and crop-spraying versions can also be supplied.

Aviation Traders (Engineering), Ltd., 21 Wigmore Street, London, W.1, and Southend Airport, Southend-on-Sea, Essex.

Aviation Traders Civil Prentice.

Bristol

Sycamore In the civil executive version of the Sycamore helicopter a pilot and four passengers can be carried, three passengers being accommodated on the rear bench-type seat. The cabin is fully soundproofed. Powered by an Alvis Leonides 73 engine, the Sycamore can also be used for prospecting and other commercial rôles by replacing the bench-type seat by three lightweight, folding and removable seats and by removing the cabin soundproofing.

Bristol Aircraft, Ltd., Filton House, Bristol.

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THE WIDGEON AT THE BRUSSELS FAIR

Operated by Sabena, the Widgeon helicopter has to date carried over 5,000 visitors on scheduled services between the Exhibition heliport and destinations beyond, and has given 100% serviceability during this period.

WESTLAND

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Business and Touring Aircraft . . .

Condesco

Crusader Announced in June this year at the Popular Flying Association rally, the Crusader is claimed to be the first British post-war two-seater light aircraft of original design. Exceptional view and cabin quietness are two main features of the design, and the standards of comfort of a family saloon car are being aimed at. The Crusader is an all-metal, low-wing, side-by-side two-seater fitted with a tricycle undercarriage, and is intended both for executive travel and for club and private-owner use. A prototype is now under construction and the company states that "no extravagant claims are being made before testing is complete, but it may be confidently predicted that the Condesco Crusader represents a new look in British light aircraft and at a price much less than a luxury car."

Condesco, Ltd., Clock Chambers, London Road, Enfield, Middlesex.

de Havilland

Chipmunk Two modified versions of this Canadian-designed elementary trainer, powered by a D.H. Gipsy Major 10, are now in touring and agricultural use in this country. The Mk 22 is the civilianized ex-R.A.F. aircraft, now used by many clubs as well as private and company owners. Most recent development, a joint project of the de Havilland and Fison-Airwork companies, is the Mk 23 agricultural Chipmunk. Designed specifically for crop-spraying and top-dressing work, this version incorporates a 14 cu ft hopper between the engine and the pilot's cockpit.

Dove Passenger accommodation in the executive version of the Dove (two Gipsy Queen 70 Mk 2 engines) comprises four armchairs—convertible into two full length couches—and a fifth seat plus provision for a sixth in the forward part of the cabin. At the rear of the cabin is a wardrobe, accommodation for light luggage and a toilet compartment, and aft and nose baggage compartments are also incorporated.

Describing the performance of the executive Dove, the de Havilland company state; "Carrying four passengers and baggage and a crew of two the aircraft can make non-stop journeys of up to 880 miles in instrument flying conditions and with a fuel reserve sufficient for one hour's stand-off; alternatively, with six passengers and baggage and the same fuel reserve the practical stage length would be about 650 miles. The cruising speed for this performance is 179 m.p.h. and the fuel consumption is no more than about 27.3 Imp. gal or 32.8 U.S. gal per hour. At a slightly higher fuel consumption the aircraft cruises at 202 m.p.h."

Heron Two basic versions of the executive Heron (four Gipsy Queen 30-2 engines) are marketed by the de Havilland company. In the Standard Executive layout there are eight reclining armchairs, two folding tables and document cabinets. "This is preferred," the company state, "when the owner envisages that for the most part the vehicle will be employed for party travel by day, when the uninterrupted space will enhance the sociability and pleasure of the journey, and when a private sleeping facility will not as a rule be needed." The Executive de Luxe—"for the owner who visualizes holding business talks which may often need to be conducted in two groups"—features a similar layout with a central partition dividing the cabin into two sections, and with "alternative cabinets for refreshments or for office files." Main and nose baggage holds, and cabin wardrobe (with access to main baggage hold) and toilet compartment are common to both versions.

The de Havilland Aircraft Co., Ltd., Hatfield, Herts.

Reading downwards, de Havilland Heron, Dove and agricultural Chipmunk.

Edgar Percival E.P.9.

Garland-Bianchi Linnet.

Hunting President.

Edgar Percival

E.P.9 A valuable feature of this aircraft is that, although primarily intended as an agricultural machine, it is equally suitable for general-purpose use as a "flying jeep" by reason of its large cabin and wide side and rear loading doors. The cabin can accommodate six passengers or a variety of mixed freight, including standard 45-gal drums of petrol or oil and standard bales of wool. Powered by a Lycoming GO-480B engine of 180 h.p., the E.P.9 is reported to have excellent handling qualities, particularly when flown at the speeds and heights appropriate to top-dressing and crop-spraying operations. A number of E.P.9s have been flown out to Australia and New Zealand where, in talks with operators, Capt. Edgar Percival's conception of the machine originated.

Describing the design philosophy behind the E.P.9, Captain Percival has stated: "Because I was designing an aircraft that had a more useful application than for fertilizing and spraying alone, I decided a metal stressed-skin wing was called for to meet the durability case. After due consideration I decided that without doubt a high-wing layout was most suitable for agricultural and rough-country work; and because of the high wing we were able to use a light-alloy wing covering since the fertilizer or spraying chemicals were

unlikely to come into contact with the wing. The fuselage has been made of steel tubing because this material appears to be the most suitable to combat the corrosive effect of some of the fertilizers and sprays used in agricultural work."

Edgar Percival Aircraft, Ltd., Stapleford Tawney Aerodrome, Abridge, Essex.

Garland-Bianchi

Linnet Now well advanced in its C. of A. flight trials is the prototype Linnet, an anglicized version of the French Piel Emeraude powered by a 90 h.p. Continental engine. A low-wing side-by-side two-seater with an enclosed cabin, the Linnet is of conventional wooden construction with ply and fabric covering. Baggage space (or an extra fuel tank increasing the total capacity to 28 Imp. gal) is incorporated behind the pilots' seats, and a full blind-flying instrument panel is included in the standard equipment (as are engine oil-cooler, starter and generator) at a selling price per aircraft of about £2,000. An initial batch of ten machines is to be constructed, with deliveries beginning next January.

The Garland-Bianchi Aircraft Co., Boyne Hill Works, Maidenhead.

Hunting Aircraft

President In standard form the executive President, a civil version of the military Pembroke powered by two Alvis Leonides 514 engines, accommodates up to six passengers in the single cabin. A refreshment cabinet and wardrobe and toilet facilities are provided, the seats are semi-reclining and there are two folding tables. A number of alternative layouts are possible: one of these divides the cabin into two separate sections seating two and four respectively. Advantages claimed for the President are its large cabin volume and the absence of cabin obstruction by virtue of the high-wing configuration. The overall length of the interior is 20ft 0.75in and the width is 5ft 6in. The height is 6ft throughout most of the cabin length, and the total available volume is 620 cu ft. The double opening doors provide an aperture measuring 5ft 2in by 4ft 2in.

Hunting Aircraft, Ltd., Luton, Beds.

Jackaroo Aircraft

Jackaroo This Tiger Moth conversion is claimed by the makers to have resulted in both the cheapest four-seater aeroplane in production and the cheapest crop-spraying aircraft available at the present time. The basic price of the four-seater passenger version is £1,270. Conversion to the agricultural rôle, employing a spray tank in the cabin and two 14ft Allman underwing spray-bars, can be effected within one hour and at an extra cost of £325. Alternative spraying equipment which can be fitted includes the Jackaroo company's own wingtip atomizers and those of Britten-Norman design. During the last year a full Certificate of Airworthiness for the Jackaroo has been obtained: 15 Jackaroos have now been constructed and a fleet of six is being operated by the Wiltshire School of Flying at Thruxton.

Jackaroo Aircraft, Ltd., Thruxton Aerodrome, Thruxton, Andover, Hants.

Saunders-Roe

P.531 Experience gained from the development of the Skeeter has been embodied in the P.531, a small five-seat helicopter powered by a Blackburn Turmo 600 gas turbine. Airframe and transmission have been designed to accept a power unit of higher output than that now fitted, and with more power the aircraft will be able to operate with higher payloads. With a degree of engine derating applied, also, the P.531 should then have a performance largely unaffected by practical climatic/altitude conditions. In its passenger-carrying rôle the machine incorporates a baggage compartment aft of the cabin.

Saunders-Roe, Ltd., Eastleigh Works, The Airport, Southampton.

Jackaroo.

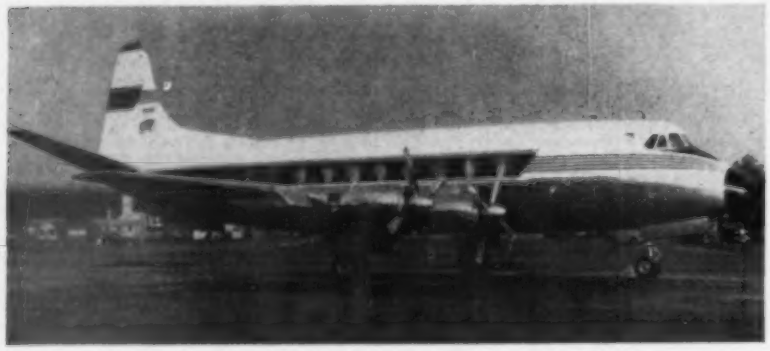
Saunders-Roe P.531.

Vickers-Armstrongs

Viscount The New Executive version of the Viscount is powered by four Rolls-Royce Dart 520 engines giving a cruising speed of 365 m.p.h., with the less powerful Mk 510s available as an alternative. Cabin layouts and styling are furnished to customer specifications and the Executive Viscounts now in service differ widely according to the individual company preferences. Some have a normal de luxe airline type of passenger saloon with 16 seats in the forward portion of the cabin and a rear portion fitted as a sleeping and conference room with twin beds. Another layout comprises a main saloon with "club lounge" arrangement of eight armchairs and a rear saloon with three armchairs and one couch. In the variety of layouts possible with this mixed type of accommodation the special furnishings and bulkheads are so constructed as to pick up on the universal seat-rail attachments which are standard on all Viscounts.

Among the optional "off the shelf" extras offered with the Executive Viscount are hydraulically operated air steps, stored inside the forward passenger door; Freon ground refrigeration, which may be needed where the aircraft is required to remain on the ground for long periods in hot climates; weather radar and a variety of other items down to sockets for electric razors. To meet the requirements of Viscounts operated on the U.S. Civil Register, other special equipment is incorporated.

Vickers-Armstrongs (Aircraft), Ltd., Weybridge, Surrey.



Above, Vickers-Armstrongs Viscount Executive; below, Westland Widgeon and Whirlwind.

Westland

Widgeon A development of the Dragonfly, the Leonides-powered Widgeon accommodates a pilot and four passengers in its soundproof cabin. Three passengers are seated on the rear bench-type seat and one in a port-side seat alongside the pilot. The seats can easily be removed when the helicopter is needed for rôles other than passenger carrying, and a baggage compartment is located in the rear fuselage structure. Apart from executive passenger travel, the rôle of crop-spraying and dusting is one in which the Widgeon can be used. Agricultural equipment available for the Widgeon includes spraying, fogging and dusting gear.

Whirlwind Normal civil passenger accommodation of the Whirlwind comprises eight seats, five facing aft and three forward, and special executive layouts are also available. A general-purpose machine, the Whirlwind includes among its other commercial uses freighting, agricultural work and aerial-crane transport of awkward-shaped objects. Alternative powerplants are the Pratt and Whitney R1340 and the Alvis Leonides Major 775.

Westland Aircraft, Ltd., Yeovil, Somerset.

Business and Touring Aircraft . . .

AUSTRALIA

Commonwealth Aircraft Corporation

CA-28 Ceres An initial batch of 40 of these agricultural aircraft is being laid down as a private venture and the company is keen to export them. Basically the Ceres is an extensive modification of the Wirraway trainer, its fuselage being lengthened by 2ft and wingspan increased. The hydraulic system is removed, the undercarriage locked down and the flaps fixed at 10 deg. The reduction gear of the Pratt and Whitney Wasp engine is removed. Hopper or spray tank can be mounted behind the engine, the pilot being located aft of this equipment in a seat raised 2ft above its previous level. The payload may be over 2,000 lb of superphosphate or 250 gal of spray. Handling qualities are reported to be excellent, with an innocuous stall at 54 m.p.h. The manufacturers are providing full spares and after-sales backing.

So far two prototypes have been completed and the first production machine should appear during 1959. Rate of production will be two per month by October. The selling price is to be £A14,000, with terms possible through a banking agency.

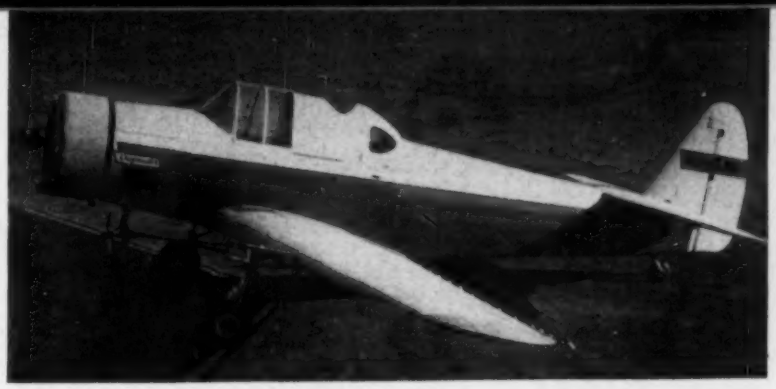
Commonwealth Aircraft Corporation, Pty., Ltd., P.O. Box 779H, Elizabeth Street, Melbourne.

Kingsford Smith Aviation Service

PL-9 Work on this new training and touring aircraft has not yet proceeded beyond the design stage. Originally sponsored by the Royal Queensland Aero Club, it is to be a fully aerobatic four-seat, low-wing monoplane powered by a Lycoming O-360 of 180 h.p.

KS.3 Cropmaster Like the Ceres, the Cropmaster is a modified trainer, in this case the World War 2 Wackett basic trainer powered by a Warner Super Scarab of 170 h.p. In the agricultural version the pilot occupies the former front cockpit and 8 cwt of solids or 80 gal of liquid can be accommodated behind and below him. A wind-driven pump is mounted beneath the fuselage immediately aft of the engine cowling and the spray-bar is located immediately behind the wing trailing-edge. The undercarriage is fixed, and total wing area, including high-lift flaps, is 190 sq ft.

Kingsford Smith Aviation Service Pty., Ltd., P.O. Box 11, Banksdown, N.S.W.



Kingsford Smith KS.3 Cropmaster.

Commonwealth Aircraft CA-28 Ceres.

CANADA

The de Havilland Aircraft of Canada

DHC.2 Beaver More than 1,250 Beavers have been produced during an unbroken run of over ten years' production. They are in service in some 58 countries and in a great variety of rôles. Included among these is agricultural work, for which the necessary pumps, sprayers or spray-bars can quickly be fitted. Loads can also be carried under the wings and dropped with or without parachutes.

For top-dressing and seeding, the Beaver carries in its cabin a 65 cu ft hopper discharging through an adjustable aperture. Reloading through a roof panel can be completed in 65 sec, thus allowing some 20 trips in an hour. Emergency dumping in a few seconds can be controlled from a button on the control column. All fuel and electrical lines near the hopper are encased in stainless steel. The Beaver spray kit has two booms emerging from the sump of the tank under the fuselage.

The de Havilland Aircraft of Canada, Ltd., Downsview, Ontario.

NETHERLANDS

Fokker

F-27 Friendship Production of the Friendship as an airliner in Holland is now well under way and first deliveries of its Fairchild-built counterpart in the United States have also begun. Both producers are offering an attractive executive version (Fairchild, see p. 595). Quantitative data are listed under Fairchild in the tables on pages 600 and 601.

Fokker's proposal for an executive version envisages a cabin divided into three compartments with a total accommodation for 10 to 16 people. The makers stress, as particularly attractive features, the high cruising speed, comfort, good visibility from the passenger cabin, and ability to use small airports. Two executive Friendships have been ordered for the use of the Dutch royal family.

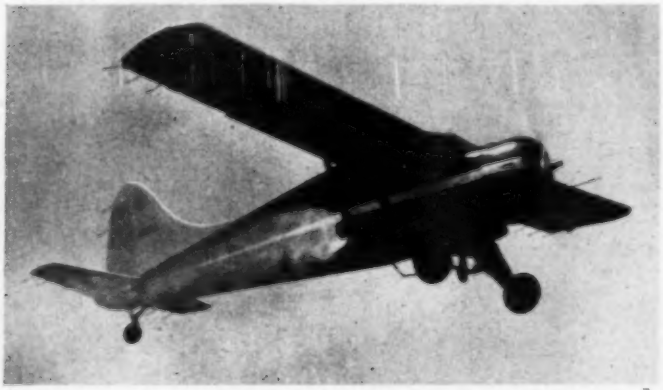
The N.V. Koninklijke Nederlandsche Vliegtuigenfabriek Fokker, Schiphol-Zuid, Amsterdam, Holland.

N.H.I.

Kolibrie H-3 Production of the first batch of ten Kolibrie ("humming bird") helicopters was begun last year and the first machine was delivered in March. Powered by two tip-mounted TJ-5 ramjets, the machine can carry one or two people and a variety of loads slung on or beneath its airframe. Fuel for about one hour's flight is carried in four cylindrical containers between the landing skids, but two of these would be used to hold spray liquid in the agricultural rôle. A separate petrol motor is carried to drive the pump.

Netherlands Helicopter Industry, N.V., Rotterdam Airport, Holland.

D.H. Canada Agricultural Beaver.



Right, N.H.I. Kolibrie H-3.

Morane Saulnier MS.760 Paris

Business and Touring Aircraft . . .

FRANCE

Boisavia

Mercurey Several score of these 4/5-seater club aircraft have been completed, variously with SNECMA Regnier, Lycoming 150 h.p. and Lycoming 180 h.p. engines. The braced, high-set wing has a stressed-plywood skin and the fuselage is of welded-steel-tube construction with fabric covering. The 4/5-seater with the 180 h.p. engine is now being produced under licence by Brissonneau et Lotz, 8 Rue Bellini, Paris 16.

Société Boisavia, 11 Rue Pierre-Brossolette, Ivry-sur-Seine, France.

Dassault

Mediterrannée During 1957 Dassault announced that design of a fast turbojet executive or command transport aircraft was in hand under the designation Mediterrannée. Construction is reported to be proceeding as a private venture. Accommodation is for ten people and power is provided by two Dassault licence-built Vipers of 3,000 lb thrust mounted in pods beneath the swept, low-set wing.

Générale Aéronautique Marcel Dassault, 78 Quai Carnot, Saint-Cloud, Seine et Oise, France.

Max Holste

Broussard 1522 A very considerable number of Broussard 1521s are being built, mostly for the French armed services, and a more recent variant with the designation 1522 has now appeared. It differs from earlier marks mainly in having full-span leading-edge slats and somewhat improved low-speed performance. About 50 Broussards have been ordered by civil customers. The machine is powered by the ubiquitous Pratt and Whitney R-985 engine and has an all-metal airframe with a high-set, braced mainplane. Ailerons droop in conjunction with the slotted flaps, directional stability being assured by twin fins and rudders.

Super Broussard This is a fully equipped transport for operation from short unimproved fields. It has been specifically designed to be powered either by two Pratt and Whitney R-1340s (with which the first machine will fly) or by turboprops of equivalent power, such as Turboméca Bastans. The change from one to other powerplant can be made with the minimum of modification.

Avions Max Holste, 11 Rue Gosset, Rheims, France.

Jodel

Having begun its career as a single- and then two-seat ultra-light club aircraft, the Jodel has now graduated into the touring field. Several variants with engines of 90 h.p. or more are being produced in factories in many parts of France, in addition to those being built privately by amateurs. Some typical examples are listed below.

Jodel D.117A Grand Tourisme More than 200 of these two-seaters have been built and sold since 1954 by Société Aéronautique Normande. They have gained many distinctions in rallies and are fully equipped for touring. The Continental 90 h.p. engine has starter, generator and screening allowing fitting of electric fuel gauges, gyro instruments, V.H.F. radio and lighting as standard equipment. The 1958 model also has special airbrakes to facilitate short landings and steep approaches. Soundproofing, cabin heating and ventilation, upholstered seats, locking doors and tinted windows, steerable tailwheel and hydraulic wheel brakes are also standard and the machine is finished in a variety of smart paint schemes. It is available for export, delivery being offered two months after placing of the order.

Jodel D.140 Mousquetaire Normande have now developed a 4/5-seat version of the Jodel powered by a Lycoming O-360 engine of 180 h.p. It is aerobatic with two occupants and the quality of its full-load performance can be judged from the table on page 601. With four passengers, 220 lb of baggage may be stowed in two large compartments. Seats can be quickly removed to accommodate a single stretcher in addition to a pilot and two others. The engine has starter, generator and screening, full blind-flying instrumentation is carried and the cabin is heated and ventilated. Rate of production is to be five per month as soon as certification tests are complete.

British agents for Normande are Rollason Aircraft and Engines, Ltd., Croydon Airport, Surrey.

Société Aéronautique Normande, Aérodrome Bernay, Eure, France.

Jodel D.120 This is the factory-built de-luxe version of the Jodel produced by Wassmer since 1955. It is powered by the Continental 90 h.p. engine and carries radio, full upholstery, spatted undercarriage and an extended canopy giving good rearward view as standard fitments. Its performance is generally similar to that of the D.117.

Etablissements Wassmer, 13 Rue Etienne-Dolet, Paris 20, France.

Piel

Emeraude This attractive little machine has been much commented upon since its first appearance as an ultra-light two-seater a few years ago. Many have been built by amateurs, but at least six different companies are producing factory-built versions. Its characteristic elliptical wing plan-form and its excellent handling characteristics have several times raised nostalgic memories of the Spitfire.

Typical examples of factory-built Emeraudes are described below.

Emeraude CP.301 This version is being built by S.C.A.Nor. Powered by a Continental 90 h.p. engine, it is a two-seater and can have full blind-flying instrumentation, radio, radio compass, undercarriage fairings, and a range of optional equipment. It can cruise at 115 m.p.h. and has a range of 600 miles. Stall, with flaps down, is at 40 m.p.h. Fuel is disposed in two tanks fore and aft of the cabin.

British agents for this machine are the Garland Bianchi Company, mentioned on p. 576.

Société des Constructions Aéronautiques du Nord, Abbeville, France.

Emeraude CP.301 Another version of the Emeraude, likewise powered by a Continental 90 h.p. engine, is being produced by Coopavia —and marketed in this country by the Tricolore Trading Co., 36 Southampton Street, London, W.C.2. Some trials were recently carried out at Croydon and showed a touch-down speed of 38 m.p.h. and a ground-run of only 150 yd. The Emeraude will fly true with the rudder pedals free and can in this condition be made to perform any figure. For inexperienced pilots the French civil training school at St. Yan has specified a method of flying in bad visibility, entailing taking the feet off the rudder pedals.

Whereas the Scanor Emeraude has a single-piece sliding canopy, this version has a fixed roof with two forward-opening doors. Seven Coopavia Emeraudes are being built each month and a total of 50 have so far been completed.

Some 28 gal of fuel, carried in tanks fore and aft of the cabin, afford a range of over 600 miles. The price of the machine, ex-works in France, is between £1,900 and £2,000 according to equipment specified.

Coopavia, 65 Rue de l'Industrie, Courbevoie, Seine, France.

Morane Saulnier

MS.760 Paris Production of this twin-Marboré-powered executive aircraft is now under way and Beechcraft in America hold the production licence. One machine has been delivered by Morane to the Shah of Persia for his personal use and at least one, assembled in America from French components, has been delivered to an American company. Performance figures are listed in the table on p.601.

The Paris is a four-seater with dual controls and a pressurized and air-conditioned cabin. The sliding canopy is power-operated. Nose-wheel undercarriage, flaps and airbrakes, electrically operated trim with variable-incidence tailplane and cockpit controls arranged according to fighter practice make this a fine "pilot's aircraft" as well as a very comfortable and fast executive machine. During an air test reported in *Flight* for June 29, 1956, C. M. Lambert described rolling the machine with four occupants.

Morane-Saulnier, 3-5 Rue Volta, Puteaux, Seine, France.

Sud Aviation

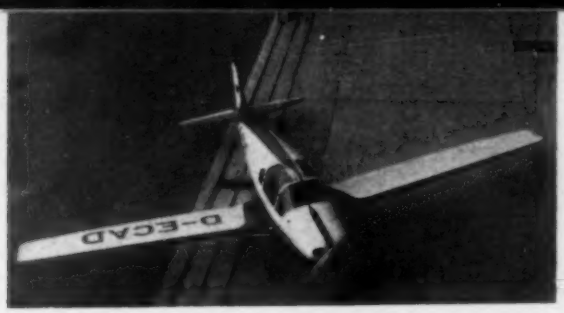
1221 Djinn More than 100 of these tip-jet driven light helicopters have been produced for both military and civil use to date. The type normally carries two people, but can be rapidly converted to use various forms of undercarriage and carry out various duties, such as cargo-lifting, spraying and ambulance work. Its performance at altitude is particularly good. The Palouste 4 air generator is arranged to be started by the pilot using a hand crank and externally mounted starting controls. The cabin is normally open at the sides, but doors can be supplied as an optional extra.

Alouette 2 More than 220 examples of this five-seat utility helicopter have now been built, mainly to military order. Powered by an Artouste shaft turbine, the Alouette has automatic fuel control linked to collective pitch control so that there is no need for a throttle twist-grip. Manœuvrability and high-altitude performance is excellent and the machine is the present holder of the world helicopter height record. The Alouette can readily be converted for a variety of specialist rôles, including crop-spraying (see picture).

Sud-Aviation, 37 Boulevard de Montmorency, Paris 16, France.

Sud Djinn

Sud Alouette 2



Klemm Kl-107.

Blume Bl 502.

GERMANY

Blume

Bl-502 Designed by Prof. Walter Blume, and built by the Focke-Wulf company, the Bl-502 is an all-metal four-seater in the tradition of the Saab Safir, to which it bears a superficial resemblance. It is powered by a Lycoming O-320-A engine of 150 b.h.p. The first aircraft flew in March last year and two prototypes were demonstrated at the Hanover Air Show in May. We reported then that the Bl-502 is designed to comply with British A.R.B. requirements in the normal category as a four-seater and in the semi-aerobatic category as a two-seater.

Redux bonding has been employed to give a smooth exterior surface to the laminar-flow wing. Access to the cockpit is via a step in the centre section flaps and an upward-opening canopy which is hinged along the cockpit centre-line. Split flaps are incorporated in the wing outboard of the centre section and extend to the long, narrow-chord ailerons. Comprehensive instrumentation and radio are fitted.

Professor Dipl. Ing. W. Blume, Leichtbau und Strömungstechnik, 1000 Fensterhaus, Duisburg-Ruhrort, West Germany.

Dornier

Do 27 Continuing in production at a very high rate is Germany's outstanding utility aircraft, which has an unusual propensity for safe operation at very low forward speeds coupled with STOL take-off and landing characteristics. Some 428 Do. 27s have been ordered for the Luftwaffe and orders have also been received for private and government machines. It can be used for dusting, for forestry work and, Dornier suggest, its unique low-speed qualities make it very suitable for advertising work and for police duties. Floats and wheel-ski combinations are available. A strong floor forms the basis of the structure and a single main frame supports the torsion-box wing. The powerplant is a Lycoming GO-480-BIA6 driving a Hartzell 98 in constant speed propeller.

Dornier Werke G.m.b.H., Brunhamstr. 21, München-Neuaubing, West Germany.

Rhein

RW 3 Series production of this unconventional pusher started in September 1957 at the works of Rhein-Flugzengbau G.m.b.H., and production is now at the rate of between eight and ten per month. The first aircraft was delivered on February 8 and orders have been received from Sweden, Brazil, Mexico, Japan and Spain. Firm interest is being displayed elsewhere. Prior to the issue of a licence to this firm many years of development work were undertaken by Rhein-West-Flug, Fischer and Co., of Porz-Westhoven.

Two models are being marketed, the RW 3-A2 with long-span (50.7ft) wings and the RW 3-A3 with wings of 34.2ft span. Each has a specific application and conversion from one to another is possible. The -A3 is intended for aerobatic training and club flying, and with fuel containers fitted to the wing tips has a useful range for touring. The long-span -A2 is intended primarily for motor-gliding and, to increase the range, slim auxiliary fuel tanks can be added under the wings. Returning from a recent demonstration visit in this country, an RW 3 completed a flight to Cologne in four hours with sufficient fuel remaining, it was claimed, for another hour's flight. Both versions are powered with the 65 b.h.p. Porsche 678/0 aircraft engine, but installation of a 95 b.h.p. Continental engine is practical.

The pusher installation was adopted so that the drag of the propeller can be overcome by shielding it behind the finpost when the aeroplane is being used as a glider. This technique would hardly be used for touring, but the still-air range without this assistance is about 600 miles.

Construction of the fuselage is of steel tube. The wings have a laminar-flow profile and are fitted with trailing-edge flaps. A diminutive tricycle undercarriage retracts into the fuselage; a skid is fitted for use when the RW 3 is used as a glider. Radio can be installed.

Rhein-Flugzeugbau G.m.b.H., Arndtstrasse 60, Krefeld/M. Gladbach, West Germany.

Klemm

Kl 107B In an age in which all-metal construction is the vogue, Klemm's three-seater is unusual in being constructed largely of wood. The fuselage is partly wood-covered and features wide forward-opening doors giving access to the cabin. The forward side-by-side seats can be adjusted on the ground, the rudder pedals are adjustable in the air and the cabin is provided with heating and ventilation. Ingenious locks on the cabin doors ensure that, when these are locked from outside, the controls are locked too.

An electric starter is provided for the 150 b.h.p. Lycoming engine, which is neatly enclosed by a horizontally divided cowling. Flaps are manually operated and wheel brakes are hydraulic. It is stated that the undercarriage shock-absorber requires no maintenance.

The Kl 107B carries a normal category C. of A. as a three-seater but is certificated for limited aerobatics with a pilot and one passenger. Standard and de luxe models are marketed, the latter costing an additional 2,700 Dm.

Klemm-Flugzeuge G.m.b.H., Karl-Benz-Strasse, Böblingen/Württemburg, West Germany.

Pützer

Elster Another Porsche-powered design, the Elster is a successor to the Alfons Pützer Company's Motoraab. A side-by-side, high-wing two-seater, it has the 52 b.h.p. engine installed within a semi-radial cowling. The aircraft is equipped with a faired nosewheel undercarriage and the shock-absorbers for the main undercarriage legs are carried on the diagonal bracing struts pivoted on the fuselage centre line. Entrance doors of substantial size are pivoted from points immediately below the wing and lift upwards. The wings are braced by a single strut each side.

Alfons Pützer K.G., Bornheimer Str. 133, West Germany.

Scheibe

SF 23A-Sperling This is the first powered aircraft to be built by the company, and was designed in 1955. Seating for the two occupants is side-by-side, dual control can be fitted and normal aerobatics are permissible. Space for luggage is provided behind the seats.

The fuselage framework is welded steel tubing covered with fabric, as is the tailplane. The wing is "constructed like a sailplane wing"; it is in two parts, employs a main spar and one auxiliary spar and an NACA 23012 section. Fuel carried in tanks in the wing roots permits an endurance of about four hours. Normally a Continental C90-12F engine, giving 95 b.h.p. for take-off is installed but alternative units are 65 or 85 h.p. engines.

Scheibe-Flugzeugbau G.m.b.H., August-Pfaltz-Strasse 23, Dachau (Obb.), West Germany.

Scheibe Sperling

SPAIN

Hispano

HA 231-R1 Developed from the HA 200-R1 Seata jet trainer, the HA 231-R1 is intended for fast liaison and executive use, but it could also be used for survey or photographic work. In the pressurized cabin there are seats for six occupants, in three rows of two. To improve the pilot's view the intake to the Marboré turbojet has been lowered and the fuselage cross-section differs from the purely military machine. The wing has also been raised slightly. Turboméca Gabizos may eventually be installed to obtain higher performance. Average cruising speed of the Marboré version at maximum continuous power and at 2,400ft is 310 kt.

Hispano Aviacion S.A., Avendo Jose Antonie 7, Madrid.

Aerotechnica S.A.

AC-12 A light two-seater helicopter powered by a 170 h.p. Lycoming O-360 engine, the AC-12 can lift a pilot, two passengers, and 50 lb of baggage, although with this payload the range is quite sharply restricted. Accommodation is provided in an egg-shaped nacelle, extensively glazed and equipped with two skids. The powerplant is mounted well forward of the bubble windscreen and is faired into a slender, cranked boom carrying the tail rotor.

Aerotecnica S.A., Velazquemy 33, Madrid.

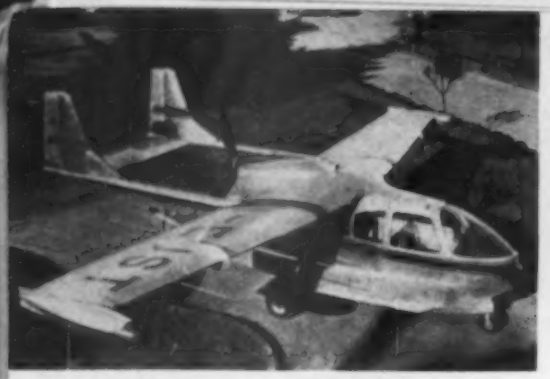
JAPAN

Fuji

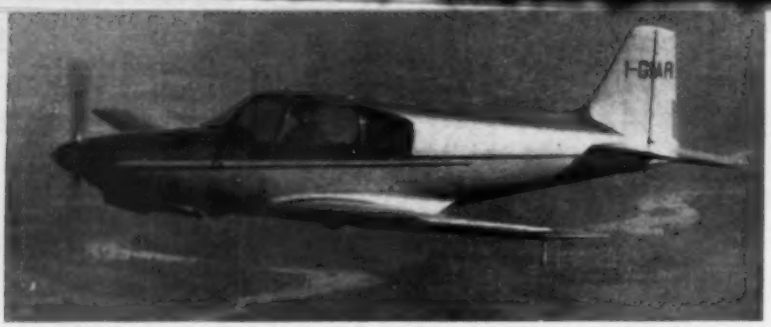
LM-1 Nikko Japan's first post-war business, liaison and cargo aircraft, the Nikko bears some resemblance to the Beech Mentor. The first aircraft was delivered in September 1956 and 29 have now been completed. The powerplant is a 228 h.p. Continental O-470-13A, which provides this sturdy four-seater with a cruising speed of 138 kt at 3,000ft on 60 per cent rated power. Price ex-works is $40,000 exclusive of radio equipment.

Fuji Heavy Industries, Ltd., Naigai Building, 18, 2-chome, Marunouchi, Cheyoda-ku, Tokyo.

Rhein RW3-A3 Multoplan



Left, Nardi FN.333.



Above, Aviamilano F.14 Nibbio.

Business and Touring Aircraft . . .

ITALY

Agusta

AZ-8L This is a four-engined transport (Alvis Leonides) which has obvious applications in the executive field. The normal layout has 22 seats and air-conditioning is provided for the cabin. Take-off is possible at full load with only three engines in operation. While the AZ-8L is suitable for operation over stages of up to 930 miles, its maximum economy is achieved with a stage distance of 375-500 miles.

Costruzioni Aeronautiche Giovanni Agusta, Cascina Costa, Gallarate.

Aviamilano

F.14 Nibbio The Nibbio is an extrapolation of the F.8L Falco. A four-seater, it retains the aerofoil sections, wing loading and power/weight ratios of the earlier and smaller aircraft, but is powered by the Lycoming O-360 engine of 180 h.p. driving a Hartzell constant-speed propeller. The airframe is entirely wooden, with plywood skinning, covered with fabric and treated with some 16 coats of paint which produce an excellent finish. All three undercarriage legs are completely retractable by electric or manual means, and full blind-flying instrumentation is fitted as standard. Radio compass and V.H.F. communications radio are offered.

Aviamilano, Via Mecadonio Melloni, 70, Milan.

Nardi

FN.333 A four-seater amphibian, the FN.333 is powered with a Continental O-470-H engine of 240 h.p. driving a constant-speed Hartzell propeller in a pusher installation. The undercarriage and outboard stabilizing floats are retractable and construction is all metal. Dual control is standard. Structural design is simple. Access is particularly easy and the aircraft is claimed to be highly manoeuvrable on both land (steerable nosewheel) and water (efficient water rudder). Take-off run on land is 300 yd and on water 460 yd. This performance is reconciled with a cruising speed of 165 m.p.h. and a normal range of 560 miles. Baggage space is provided behind the rear seats. Standard equipment includes VHF transmitter and receiver and hydraulic brakes.

Nardi, Aeroporto Forlanini, Milan.

Piaggio

P.136-L This is a twin-engined amphibian of many merits. It is powered with two Lycoming GSO-480-B1C6 engines giving 340 h.p. each for take-off. When he flew a machine of this type early this year, C. M. Lambert of *Flight*'s staff reported: "Although it is a fairly large machine, capable of carrying five people and baggage, or pilot, two stretchers and medical attendant, it can get into really small grass fields and operate from comparatively rough water. The Italian demonstration pilot landed at full weight on the short, bumpy grass strip at Elstree and later did circuits-and-bumps—or orbits and splashes—in two-foot high waves, a strong current and a cross-wind on the Medway. In America a P.136-L1 took off from water at 7,800ft a.s.l. (they have that sort of water in the States) at full load in 34 seconds. There is no nonsense about the aircraft at all." The writer further reported: "The very comfortable five-seat cabin is reached by stepping on the spray dam conveniently riveted to the chine, while mooring and anchoring operations are performed by opening the starboard windscreen panel, immediately ahead of which are the anchor locker and mooring cleat. Full nautical riding and navigation lights are fitted. A goodly baggage compartment is in the back of the passenger cabin, while bulkier cargo (within fairly strict c.g. limitations) may be stowed in a large chamber with a hatch just aft of the wing; the hatch coaming of this serves as a foot-step for reaching the top of the fuselage."

P.166 This attractive twin-engined landplane was described in the May 23 issue of *Flight* by James Hay Stevens in these terms: "A direct adaptation of the well-tried P.136 amphibian, the Piaggio P.166 is aimed directly at the executive market, and structural weight saved by deletion of the planing bottom and wing-tip floats having been applied as much to improving range as to increasing payload. Considerable effort has also been devoted to interchangeability between the P.136 and the P.166, so that wings, engines and main undercarriage are identical. Control runs and systems, for the most part, have common components although, with the redistribution of side areas, an entirely new tail unit had to be designed. However, any user of the P.136 requiring a landplane of greater capacity, range and speed would still have the advantage of a considerable number of common spares."

Pilots sit side by side, with full dual flying controls and with engine hydraulic console between, on a slightly raised flight deck. Behind are the four main passenger seats in two rows, either facing one another or all facing forward. The inboard arms of the seats have quick releases which allow them to be folded down and a central squab and back unit to be clipped in. On the starboard side is a toilet, with a door, and to port there is provision for a galley.

P.149-D This aircraft also was flown on *Flight*'s behalf by James Hay Stevens, and he reported thus: "The Piaggio P.149-D is a dream aeroplane—cruising at a genuine economical 145 m.p.h. with four passengers and baggage, or even five passengers, and as lively in every aerobatic as the most exacting virtuoso could desire. Add to this, delightful controls plus a need for co-ordination but a forgivingness which preserves the undeserving pilot from the consequences of error, and one has an ideal combination trainer and tourer.

Piaggio and C., Via Antonio Cecchi 6, Genoa.

Above, Piaggio P.149-D.

Below right, Piaggio P.166.

Below left, Piaggio P.136-L.

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and a new range of units
in the 1,000 h.p. bracket
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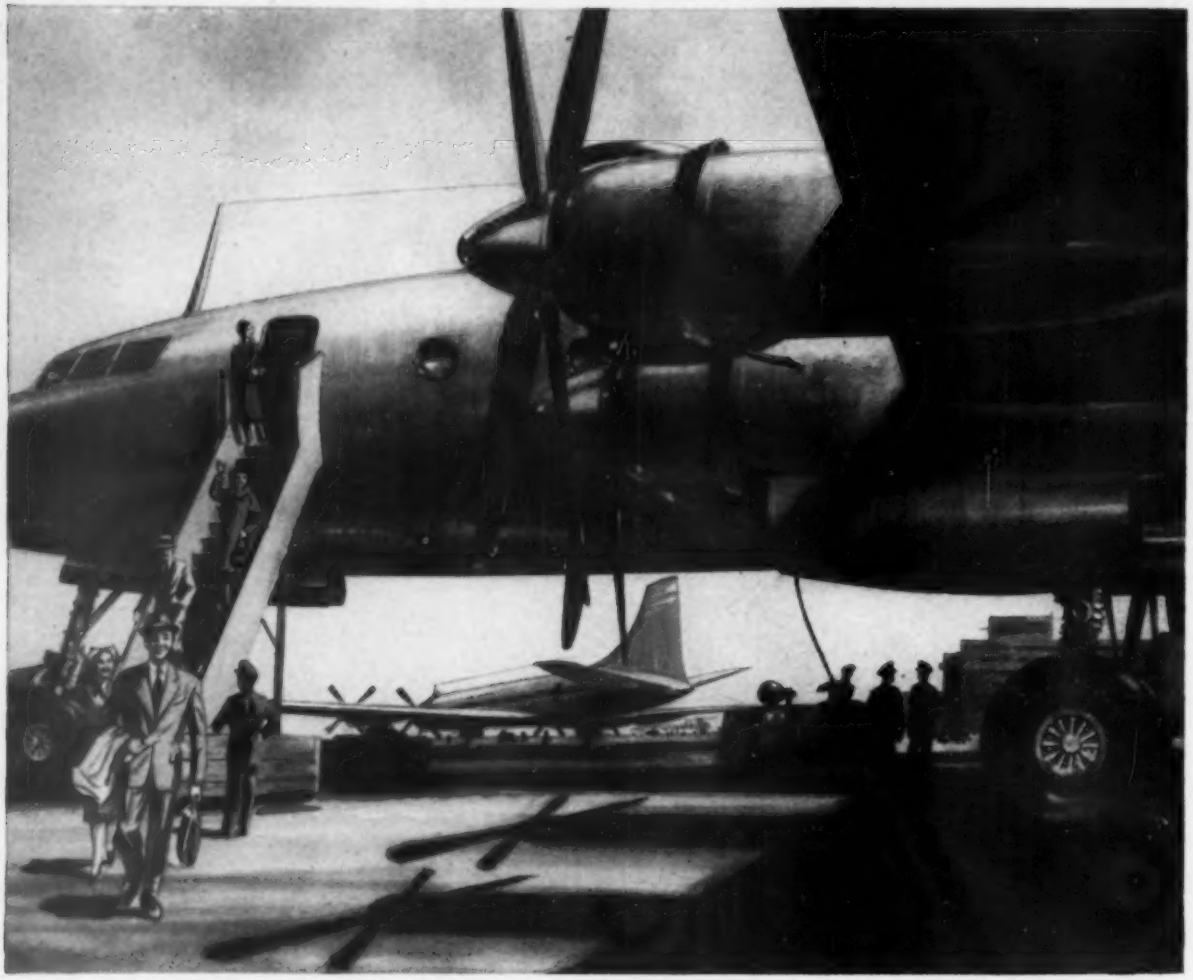

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GOODYEAR AVIATION DIVISION

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Business and Touring Aircraft . . .

CZECHOSLOVAKIA

Omnipol

L-60 Brigadyr (Agricolta) A high-wing monoplane of STOL configuration, the Brigadyr is intended for agricultural work, liaison and executive transport, photographic reconnaissance and as an air ambulance. Slats and slotted flaps are mechanically linked; the ailerons droop; and the undercarriage, intended for use on rough ground, is fixed. Hydraulic brakes are fitted. Powerplant is a Praga Doris B flat six of 220 h.p. A 77-gallon hopper for either powder or liquids is provided for agricultural work.

HC-2 Heli-baby The HC-2 is claimed to be the world's lightest helicopter fitted with a three-bladed fully articulated rotor and dual controls. Both a trainer and "observation post," it is also intended for courier-liaison work. Special features claimed are extremely low vibration and noise-level, high manœuvrability and economy of fuel. In the last respect a figure of 4.85 gal is quoted for an hour's flight in which 220 lb of payload is lifted 62 miles.

The power unit is a flat-four Praga DH developing 83 h.p. at 3,000 r.p.m. Gross weight is 1,280 lb and range at cruising speed is 93 st m.

LD40 Meta-Sokol An attractive new member of the Omnipol range of excellent touring and training aircraft, the Meta-Sokol is an all-metal three-seater. Monocoque construction is employed for the whole fuselage and access is easier than in some low-wing designs, as the canopy sill is brought low over the wing root. The undercarriage is retractable; the castoring tailwheel is mounted well forward along the fuselage and is linked with the rudder for taxying. A variable-pitch propeller is driven by a Walter Minor 4-111 engine.

Morava A light twin of modern design, the Morava (L 200) is an all-metal five-seater powered by two Walter Minor 6-111 in-line engines of 160 h.p. each. The nosewheel is steerable and equipment includes de-icing and long-range fuel tanks mounted on each wing tip. This specification might apply to several American light twins, but the small twin fins of the Morava give it a distinctive appearance. The luggage compartment is accessible both from inside and outside the aircraft.

Super Aero Now familiar in this country, the Super Aero has been described in *Flight* as "a pilot's aeroplane." (It was the subject of an air test last year.) It is powered by two Walter Minor 4-111 engines developing 105 h.p., of which full advantage is taken by two V 40 electrically operated v.p. metal propellers. It has a single-engine performance.

The cabin seats two in front and two or three on a rear bench-type seat. The standard of interior fittings and trim is very good; the walls are sound- and heat-proof and ventilation, heating and lighting systems are provided. Access is via an upward-opening door on the port side, and space for baggage is provided behind the rear seat. Smoking is permitted. Both undercarriage and flaps are electrically operated.

Spares for the Super Aero are being stocked by Rollason Aircraft and Engines Ltd., at Croydon and the aircraft is available in this country through the Aircraft and General Finance Corporation Ltd., 26-27 Poultry Chambers, 11 Poultry, London, E.C.2.

Omnipol Ltd., Washingtonova 11, Prague 3, Czechoslovakia.

Omnipol HC-2 Heli-baby.

Omnipol Meta-Sokol.

POLAND

Motoimport

P.Z.L-102 Kos The Kos (Blackbird) had its first public showing at the recent gliding championship at Leszno, where it attracted considerable attention. Studies on the aircraft began as recently as August 1957 and the prototype flew in May 1958. It is an all-metal two-seater of petite appearance with a fixed tailwheel undercarriage. Hydraulic brakes are fitted. The power unit is a WN-1 four-cylinder horizontally opposed engine of Polish design, but Continental A65 or C85 units are alternatives. A fixed-pitch wooden propeller is fitted and the cowling is split horizontally and opens alligator-fashion. Fuel is carried in a 13-gal tank in the fuselage aft of the cockpit.

P.Z.L.-101 In series production is the Polish radial-engined agricultural P.Z.L.-101. The power unit is an A1-14R of 260 h.p., and 1,100 lb of chemical can be carried in the hopper. Span is 41ft and gross weight 3,530 lb.

P.Z.L. SM-1Z This agricultural helicopter is a single-seater designed to lift a disposable load of 970 lb. It is suitable for spraying, dusting, top-dressing or forestry work, and has been developed for use in arctic climates. Equipment is provided for night operations. The powerplant is an Al-26W seven-cylinder radial producing 575 h.p. for take-off. This provides the SM-1Z with an initial rate of climb of 1,000 ft/min.

Motoimport, Przemyslowa 26, Warsaw, Poland.

Omnipol Super Aero.

SWEDEN

Saab

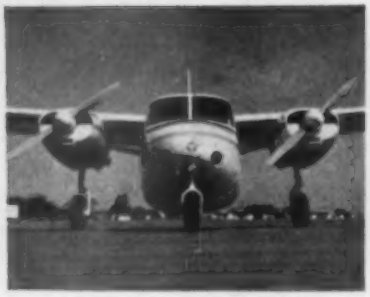
91A Safir This aircraft, which first flew in 1945, has proved most successful, and continues in production. The 91A is powered with a D.H. Gipsy Major 10 engine of 145 b.h.p.

91C A later version of the Safir (although it first flew five years ago) is the four-seater powered by a 190 h.p. Lycoming O-435-A six-cylinder engine. Intended primarily for business and touring, it can accommodate one stretcher case.

Svenska Aeroplan A.B., Linköping, Sweden.

Below, PZL-102 Kos.

Left, Saab Safir 91D.



Above, Aero Commander Model 500.

Above, Aero Commander Model 680-E.

Business and Touring Aircraft . . .

UNITED STATES

Aero

Commander 680-E Together with the 500 the 680-E has recently been added to the Commander line, which now totals five models; it is distinguished by a wing of greater span permitting higher loads to be carried without sacrifice of range. Supercharged engines are fitted—Lycoming GSO-480-B1A-6s of 340 h.p. —and the interior is available in several harmonizing colour combinations, with either four, five or six seats. A maker's announcement runs: "The interior features a new three-position seat with tuck-away arm rests, individual ash tray and lighter for each seat, new reading light, fresh-air outlet fixture, and all set in a richly appointed leather and fabric compartment. The new 680-E features the functional three-section instrument panel. The centre panel is devoted entirely to the engine instruments, flanked on either side by a complete flight instrument section for both pilot and co-pilot. In addition, each section is hinged at the bottom, and can be folded down for easy access to all instruments. . . ."

Commander 500 Announcing this new lighter and lower-powered version of the Commander 560 the president of Aero Design and Engineering said that it had been designed to fill the need for a high-performance full-size executive transport at a price substantially below the existing Commander line. The interior can be arranged to seat from five to seven people and the seats are foam filled. Power is provided by two of the new Lycoming O-450 wet sump direct-drive engines of 250 h.p.

Commander 560-E This model is distinguished from its forerunner the 560-A in having a wing of greater span. Like all Commanders it has a cabin 127.5in long, 52in wide and 53in high. The available space totals 177 cu ft, into which are normally fitted two adjustable and reclining seats for two pilots and a bench for three at the rear. In addition, a baggage compartment is provided, with a volumetric capacity of 32 cu ft and a weight limit of 350 lb. Special interiors can be provided for up to seven persons, or for smaller numbers together with folding tables or wall couches. The engines are Lycoming GO-480-C1B6s of 295 h.p.

Commander 680 Super Dated from late 1955, this version has supercharged engines —Lycoming GSO-480-B1A6s, giving 340 h.p. for take-off. While retaining the original 44ft span wing, the Super has the same fuel and oil systems as the 560-E and thus has comparable range (in excess of 1,500 miles).

720 Alti-Cruiser A recent member of the Commander family, the Alti-Cruiser (span 44ft) is distinguished from the others in having a pressurized cabin, which enables more practical use to be made of the high-altitude characteristics of the supercharged Lycoming GSO-480-B engines. When cruising at 15,000ft the cabin altitude is equivalent to 9,000ft.

Aero Design and Engineering Co., Box 118, Bethany, Oklahoma.

Aerocar

Model 1 This is a "roadable" aircraft—the most thoroughly proved of its type. Five have been built over a period of seven years, and full C.A.A. type certification as an aircraft and certification for road use in the U.S.A. has been received. For road use the car (or front-fuselage) section is driven either by itself or with the remainder of the aircraft folded to form a towed trailer. Assembly of the aircraft prior to flying can be performed by one person in less than ten minutes. The powerplant is a Lycoming O-320 which delivers an effective 135 h.p. to the propeller in flight or 40 h.p. to the wheels when on the road.

Model 2 This new model does not have the convertible feature of the Model 1, i.e., it is simply an aircraft and is not roadable. With the removal of the various car components, a reduction in weight of about 360 lb has been achieved. This permits the Model 2 to carry four passengers, 60 lb of baggage and full fuel at the same gross weight (2,100 lb) as the earlier two-seat Aerocars.

Aerocar, Inc., Longview, Washington.

Acme

Anser A-1 A forthcoming six-passenger twin-jet amphibian, the Anser is expected to cruise at about 450 m.p.h. on the thrust of two Continental 420M units each of 1,200 lb static thrust. Maximum range should be over 2,000 miles. The upswept rear hull will carry a butterfly tail.

Aircraft Marine Engineering Corp., Van Nuys, California.

Baumann

Brigadier B-360 This aircraft is a developed version of the B-290 and has two Lycoming 180 h.p. engines. A five-seater pusher design, it is of all-metal construction and has a retractable undercarriage. Also reported is the B-480 Super Brigadier, with Continental O-470-B engines of 240 h.p. each. This will have different dimensions.

Baumann Aircraft Corp., P.O. Box 468, North Hollywood, California.

Bee

Queen Bee This four-seater, now under construction, will be characterized by a car-type cabin, butterfly tail, and untapered low wing carrying fuel in tip tanks. The engine is a Lycoming O-320-A1A of 150 h.p.

Bee Aviation Associates, Montgomery Field, San Diego, 11, California.

Beech

Super 18 The Super 18 is normally fitted out for a crew of two and from five to seven passengers. It is of tail-down configuration and is powered by two Pratt and Whitney Wasp Junior engines of 450 h.p. each.

Bonanza The 1958 Bonanza is offered with the Continental IO-470-C fuel-injection engine of 250 h.p. A four-seater, it is claimed to be at least 30 m.p.h. faster than any other single-engined commercial aircraft, having a 200 m.p.h. cruising speed.

Twin Bonanza D50A and F50 These two versions differ principally in engine installation: the D50A has two 295 h.p. Lycoming GO-480-G2D6s and the F50 has 340 h.p. Lycoming GSO-480-B1B6s. In each case the propellers are three-blade, full-feathering Hartzells. The F50 has oxygen and both models have night-flying gear, landing lights, cabin heater and fresh-air ventilating system. A choice is offered of six interiors, seating from four to seven persons. In two of these arrangements a 6ft 10in couch runs fore and aft.

Travel Air 95 The Travel Air is essentially a scaled-down Twin Bonanza seating four and powered by Lycoming O-360-A1A engines each of 180 h.p. Standard cabin equipment includes ultra-violet-proof windshields and windows; tinted side windows; soundproofing ("super soundproofing is optional"); full upholstery, including wall to wall rug; loudspeaker; map compartment and glove compartment; two adjustable sunshades; ashtrays; lighter; Janitrol 35,000 B.Th.U. heater; clear-vision panel for pilot; coathanger; adjustable reclining three-position front seat; removable reclining (two-position) rear seat; shoulder harness.

Beech Aircraft Corp., Wichita, Kansas.

Bell

47J Ranger This is a four-seater helicopter with "limousine luxury." The cabin has been decorated by Horton and Horton, the noted American air interior stylists, and the buyer can choose from ten colour schemes. The standard engine is a Lycoming VO-435.

47G-2 Trooper The Trooper has the same engine as the Ranger but is a workhorse rather than a limousine. Crop-dusting and spraying equipment is readily installed, and the company claims that Texas ranchers say that a helicopter of this type is worth fifteen to twenty good men on good horses.

Bell Helicopter Corp., P.O. Box 482, Fort Worth, 1, Texas.

Callair

A-4 Built specifically for agricultural work, this is a low-wing monoplane with optional cabin enclosure and a rear seat. The engine is a 150 h.p. Lycoming.

Call Aircraft Co., Afton, Wyoming.

(Continued on page 594)

Below, Aerocar Model 2.

Beechcraft Travel Air.

Aircraft of the Timken Roller Bearing Company's business fleet—a Beechcraft MS.760, a modified North American B-25, and a Bonanza.

Business Aviation in the U.S.A.

OVER 26,000 AIRCRAFT IN USE : PRESENT AND FUTURE TRENDS

By DONALD A. IMGRAM
and
PETER E. VIEMEISTER

NOWHERE in the world has the field of business aviation been so fully developed as in the United States. There, according to the National Business Aircraft Association, no fewer than 26,148 aircraft were being actively used for business transportation as of January 1, 1958. Their breakdown of aircraft by class is as follows:—

Class	Type	No. of active a/c
I	Multi-engine (nine place and over)	1,041
II	Multi-engine (under nine place)	2,304
III	Single-engine (three place and over)	13,852
IV	Single-engine (one and two place)	8,796
V	Miscellaneous	155
		26,148

Business aircraft thus greatly outnumber the 1,800 now being used by scheduled commercial airlines in the U.S. In addition, executive aircraft fly more hours and more miles than the airlines, and it is only in passenger-miles flown that the airline totals exceed those of the business fleets. In 1955 business aircraft flew a total of 4.3 million hours, a 56 per cent increase over the figure recorded five years earlier. And this remarkable growth shows no signs of leveling off. If C.A.A. forecasts prove correct, business aviation activity will continue to expand until by 1965 the impressive total of 7.8 million hours will be recorded annually.

A large majority of the companies that engage in business flying own and operate only one aircraft. Some corporations, however, employ a large fleet of multi-engine types. Several major U.S. oil companies operate more than 20 aircraft, many of which are multi-engine types.

With the exception of four recently acquired Vickers Viscounts (three Model 764s to U.S. Steel and a Model 765 to Standard Oil of California) and a single Morane Saulnier MS-760 four-place turbojet, all business flying in the U.S.A. is performed with piston-engine aeroplanes. Soon, however, turbine models will be placed in service. The first executive model Fairchild F-27 will be delivered within the next few months, to be followed in early 1959 by deliveries of the Grumman Gulfstream. Both aircraft are powered by Rolls-Royce Dart turboprops and will give the traveling executive a standard of comfort comparable to that offered by the turbine-equipped airlines.

In the near future turbojet aircraft designed and built in the U.S.A. may also be available for executive transportation. Two prototypes of the Lockheed Jetstar, "America's first turbojet business aeroplane," are now flying, and operators are showing increasing interest in a pure-jet business aircraft. The turbojet-powered North American Sabreliner and McDonnell M-119 will soon make their first flights, and executive versions of these aircraft may also be offered to business operators.

As is the case with the airlines, the introduction of turbines to American business fleets will bring significant changes and pose challenges to the operators. In particular, fuel scheduling, maintenance and operational problems will be encountered. Costs of business transportation will also rise. But before reviewing the new aircraft it will be interesting to examine the status and method of operation of business aviation in the U.S.A.

THE AUTHORS are members of the firm Viemeister Associates, Inc., of Lindenhurst, New York, marketing and aeronautical engineering consultants. Mr. Imgram received his Aeronautical Engineering Degree from Brooklyn Polytechnic Institute and is experienced in design, analysis, structural test, and flight test of missiles and aircraft. Mr. Viemeister is an engineering graduate of Rensselaer Polytechnic Institute and a member of the Institute of Aeronautical Sciences, Society of Automotive Engineers, American Rocket Society, and the National Aviation Association.

Business-aircraft Flying. The specific reasons for purchasing a corporate aircraft may vary from company to company, but the main function of all business aeroplanes is to minimize the non-productive time of high-salaried executives. The cost of private air transportation is generally higher than that of public means. However, the time of important executives is an important commodity, measurable in dollars and cents. Companies who have compared the value of the time saved with the added cost of using a private aircraft often find they can justify the use of a business aircraft on a cost basis alone. It was not surprising, therefore, that during the recent American recession many companies reduced other operating expenses while retaining their aeroplanes. Flying activities actually increased to some extent during this period as more missions were flown to stimulate lagging sales. Formerly, many companies concentrated their flying activities on intra-plant controls, and used their aeroplanes for transportation of personnel with those responsibilities. When the need for greater sales efforts became apparent these companies made their aircraft available to salesmen so that more ground could be covered. Business aircraft thus proved to be a universal tool, adaptable for planning, production, sales, or wherever needed to trouble-shoot within the management structure or outside.

Most business flights originate or terminate at airports not served by the airlines (in the U.S. fewer than 700 of the 7,028 airports are served by scheduled flights). In these cases private aircraft have proved particularly worthwhile as a time saving device. A large proportion of all business traffic, however, is recorded on routes well served by major airlines. Typical of these is the New York to Washington, D.C., one of the world's busiest. More than one New York firm operates its own regularly scheduled weekly or bi-weekly flights over this same route with company aeroplanes, in direct competition with the airlines. These companies are, in fact, operating "custom airlines."

Business Aviation in the U.S.A. . . .

Business aircraft can save time on medium-length routes because they operate at and for the convenience of the passengers. As most experienced airline riders will attest, the most frustrating part of a commercial flight is the time consumed in the terminals at both ends of the trip. There is waiting to purchase a ticket, or if a ticket is already in one's possession there is waiting to check in. Time is also lost in checking and claiming baggage. Return reservations also pose a problem, since quite often the length of a conference cannot be accurately predicted in advance. Under these conditions return reservations are ordinarily made for a late flight home. Should the meeting end early the businessman must try to change reservations—a near impossibility—or attempt to board a flight as a stand-by passenger. Business aircraft, by leaving as soon as the passengers are ready to leave, eliminate nearly all "terminal" time.

Only over long ranges does the speed advantage of the airliner prevail. A number of executives prefer to fly by commercial means on longer routes, but many coast-to-coast business flights are still being made by DC-3s. Some executives using the airlines for longer trips have their private aircraft precede them to the destination so that these will be immediately ready for local use.

Business aircraft operations vary with the objectives and attitudes of management. Some aeroplanes carry only top executives, but many firms permit working-level personnel to use company aircraft. Defense contractors often fly field personnel to remote military bases on Monday mornings and pick them up on Friday evenings. Such operations benefit everyone concerned and make easier the problem of obtaining people willing to be assigned to out-of-the-way places.

Load factors on executive aircraft vary with the type of usage. "President's" aeroplanes rarely fly more than one or two key executives. Load factors on more utilitarian company aircraft are generally higher, and it is not uncommon for a DC-3 to record an annual load factor of 75 per cent.

Annual utilizations of business aeroplanes generally range from 200 hours on the smallest types to the 1,000-hour totals of several DC-3s. The table below (reprinted from *Flight* for November 8, 1957) presents some statistics on business flying gathered during a recent survey of business operators.

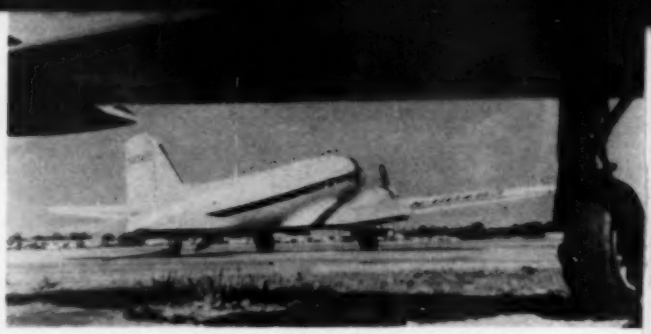
	Range of Answers	Mean
Annual utilization, hr	250-1,000	596
Number of passengers per trip		4.03
Length of trip, miles	50-2,400	628
Typical cruising speed, m.p.h.	180-300	
Typical cruising altitude, ft	4,000-15,000	7,900
Percentage of trips on I.F.R.	5-95 per cent	42.4 per cent
Typical fuel reserves	10-65 per cent	21.9 per cent
Runway size of home airport, ft	3,000-12,500	5,880
Smallest runway visited	1,500-4,500	2,830

Not all business flights are made for business purposes. Many companies reason that as long as they own an aircraft they might as well use it as much as possible. Some firms allow executive personnel to charter company aircraft at low rates. Others, whose top executives are already in such high tax brackets that additional compensation would be all but meaningless, offer key men a reasonable number of flight hours per month for personal use. It is interesting to note that during the last "Derby Weekend" at Churchill Downs, 170 heavy twin-engined aircraft (twin Beech or larger) visited Louisville, Kentucky. Most likely a majority of these aircraft were corporately owned.

The equipment being used in the United States generally falls into three main categories: (1) the over-12,000 lb multi-engine, or "heavy twin," class; (2) the under-12,000 lb multi-engine, or "light twin," class; and (3), the single-engine class.

The Heavy Twins. The most popular heavy twin executive aircraft is the venerable DC-3. Approximately 460 are currently being used for corporate transportation. Large numbers of these aircraft were made available at the end of World War II for what must be considered a ridiculously low price by today's standards. It was quite possible to purchase a relatively new Government surplus C-47—many were sold with less than 200 hours—for as little as $20,000. Even after fitting an executive interior and adding electronics the total investment was under $100,000. These aircraft have proved so useful and trouble-free that many of the original post-war buyers still retain them. These aeroplanes, some having accumulated less than 5,000 hours in the intervening years, are for the most part in excellent condition and might command as much as $150,000 on today's somewhat overcrowded used-aircraft market.

The end of World War II also saw the release of many other surplus transport-type aircraft which were soon adapted for private use. The twin Beech (formerly the military C-45) has proved quite popular among smaller companies. Beech continued production of this early type, known as the Model 18, well into the 1950s. In 1954 they produced a modernized version designated the Super 18. The Super 18 incorporates numerous structural improvements,



"The most popular heavy twin is the venerable DC-3."

including a deeper fuselage, integral steps, and an increased wing span. It sells today for $118,000 with factory-installed equipment. To date Beech has produced over 6,500 twin Beeches of all types. [Although the twin Beech does not come within the strict definition of a heavy twin—it weighs less than 10,000 lb—it is generally regarded as one. Its eventual replacement almost certainly will weigh more than 12,000 lb.—Ed.]

Numerous surplus Lockheeds of several types are currently in service with American business fleets. All of these are based on the Model 18 Lockheed Lodestar, production of which was discontinued in 1943 after the construction of several hundred aircraft. The Lodestar had Wright Cyclone 1,350 h.p. engines which gave 250 m.p.h. cruising over an 1,800 st. mile range. The Lockheed PV-1 Ventura, a subsequent military version of the Lodestar, was equipped with Pratt and Whitney R-2800 engines (some later versions had Wright Cyclone R-2600 engines), giving a 270 m.p.h. cruise range.

Several conversions of these aircraft have been produced with favourable results. The Mk 1 Learstar which is the only C.A.R. 4b certified conversion, is considered by many to be the first of the piston-powered heavy twins. Range and speed of the Mk 1 are 2,400 st. mile (with one hour's reserve) and 272 m.p.h., respectively. Some Mk 2 versions have been produced. The Mk 1 aeroplane is purchased directly from the factory—for approximately $500,000—while the Mk 2 conversion is performed on customer-furnished airframes, for about $190,000. The Mk 2 aeroplane is somewhat lighter than the Mk 1 (22,500 lb as against 24,500 lb), but has essentially the same performance. Both versions utilize R-1820 engines. Production rights to the Learstar have recently been acquired by the PacAero Engineering Corp. Approximately 25 Learstars are now in use.

Heaviest of the Lockheeds is the Howard Super Ventura, with an allowable gross weight of just over 31,000 lb. Its R-2800 engines give it a 300 m.p.h. cruise speed and a coast-to-coast range. The Super Ventura costs around $500,000. Two dozen are in service.

The failure of the Lockheeds to be even more popular than they are—about 250 Lockheeds of various models are in service—can be traced in part to a series of recent accidents involving these aircraft. In 1957, according to the C.A.B., executive model Lockheeds were involved in ten accidents of all types and for all causes. Executive DC-3s, in contrast, although they outnumber the Lockheeds by a near 2:1 ratio, were involved in only four accidents in 1957.

A number of larger corporations in the U.S. have purchased Convair 240s, 340s and 440s in recent months. Some of these aeroplanes are surplus airliners, but many have been bought directly from Convair. Executive Convairs generally have additional internal fuel tankage to provide coast-to-coast range. With custom interiors—some costing in excess of $100,000—these aircraft, along with the previously mentioned Viscounts, are perhaps the most luxurious executive aeroplanes in use. Surplus Convairs can be obtained for between $250,000 to $350,000, and it is expected that increasing numbers will be placed in executive operation as the airlines dispose of their piston fleets. Over 60 Convairs are currently in corporate service, the Garrett AiResearch Aviation Service having alone modified 50 of these.

Also in the heavy-twin class, but existing in much fewer numbers, are the executive conversions of the Martin 202, and the surplus light bombers of the B-23, B-25, and Martin and Douglas B-26 types. It is unlikely that converted light bombers will be used in major quantities for corporate transportation. One U.S. corporation operates a modified C-87 (the military transport version of the B-24), while several maintain B-17s.

In the heavy-amphibian class, several Convair PBYs are occasionally seen in corporate livery. One of these is licensed under C.A.R. 4b regulations. Approximately 35 Grumman Mallards are being used in the U.S.

Re-equipment in the Heavy-twin Field. On the re-equipment scene for the heavy-twin operator are several interesting aircraft. Largest of these and the only one available at the present time is the F-27, the American version of the Fokker Friendship, built under licence by Fairchild. Conceived as a 280 m.p.h. 36-seat feederliner, the F-27 is powered by Rolls-Royce RDa.6s. With a 45-minute reserve the executive model F-27 will have a range of 2,000 st. miles with 2,151 lb payload. Some later aeroplanes will be equipped with more powerful RDa.7s to give 300 m.p.h. cruising.

To meet the individual requirements of each business aircraft

operator, Fairchild is installing either custom or standard executive interiors. A standard cabin interior, selected by a majority of the corporations who have ordered the F-27, seats 16. With excellent downward visibility afforded to its high-wing configuration, the F-27 should prove popular among corporations interested in a 300 m.p.h. airline-size turbine aeroplane. To date 13 firm orders have been placed for executive F-27s. The announced purchasers include the Continental Can Co., General Tire and Rubber Co., Butler Aviation, Bank of Mexico, Westinghouse Electric, Ideal Cement Co., Champion Spark Plug Co., and Kimberly Clark Corp.

With many airline orders on the books and the prospect of an eventual military order, Fairchild is in a position to pass along to the customer the benefits of large-scale production. Priced at $590,000, not including custom interiors and electronics, the F-27 is likely to be the lowest priced of the new turbine aircraft.

Somewhat smaller than the F-27, but still with DC-3 cabin size, is the Grumman Gulfstream. This 350 m.p.h. aircraft, which made its maiden flight on August 14, is powered by two RDa.7s and has a range capability with 2,520 lb of payload, of 2,000 st. miles, including a 45-minute reserve. The Gulfstream was developed with corporate funds alone, and, to the credit of business aviation, it is significant that Grumman has staked so much on the future of business flying. A production line has been established at Bethpage and assembly of No. 5 aeroplane is now (October) in progress. To date Grumman has received about 30 orders for Gulfstreams. The only announced purchaser is Sinclair Oil Company, who will receive the third aircraft. Grumman will retain the first two for test purposes.

One outstanding performance feature of the Gulfstream is its ability to be nosed-over while flying at maximum speed. There is no V_{DF} on the aircraft, enough "beef" having been provided to permit subsequent installation (and retrofit) of the much more powerful RDa.10 engines. The higher-powered Gulfstream will have a 400 m.p.h. speed.

Completing the heavy-twin turboprop picture are possible modifications of Convairs to mount Napier Elands or Allison T-56s. At the present time business operators are not showing too great an interest in retrofitting turbines to Convair aircraft, but there may be a limited market for this type of aeroplane in the future. The forthcoming Canadair 540—a modernized version of the Convair 440 with two Eland 6s—might be suitable for this purpose.

No substantial executive market is visualized for used DC-6, DC-7, or Constellation-type aircraft. Only a small market, too, exists for four-engine Viscount-type business aeroplanes.

Looking ahead several years in the turboprop field, there is a distinct possibility that the Lycoming T55 and General Electric T64 engines may be used to power heavy twins. The two turboprops are rated at 1,600 s.h.p. and 2,600 s.h.p. respectively. The T64 in particular is regarded as being a logical engine for "growth" versions of Dart-powered aircraft. The U.S. Government, having supported development of the engines, might prefer them to the Dart, should they procure a heavy-twin aeroplane.

Two turbojet aircraft which appear suitable for executive use as heavy twins have received much industry attention in recent months. These are the Lockheed Jetstar and the McDonnell M-119. Both were developed with private funds in response to an Air Force request for an "off-the-shelf" utility jet transport capable of carrying eight passengers at a cruise speed of M=0.76. "Combat" range of the transport, termed the UCX in the Air Materiel Command specification, was to be 1,500 n.m.

The Lockheed Jetstar, powered by two Bristol BOr. 1/5 Orpheus engines arranged Caravelle-style on the rear fuselage, made its maiden flight on September 4, 1957. Two prototypes are now flying, and have recorded a series of impressive 600 m.p.h. flights while being demonstrated to various military and civilian personnel. The Jetstar seats ten passengers in a 28ft-long pressurized cabin area (measured from the cockpit bulkhead to the rear pressure dome). In comparison, the Gulfstream cabin length (similarly calculated) is 38ft; and the F-27, of course, is much larger. Stand-up headroom is achieved through the Jetstar cabin by recessing the aisle below the general floor level.

Some Jetstar flights have been made with external fuel tanks. It is estimated by Lockheed that the aeroplane will eventually have a 3,000-mile range with the added tankage. Gross weight of the long range version may be close to 40,000 lb.

Lockheed has announced that no civilian Jetstars would be built unless a prior military order was received. They are, however, accepting "reserve priority positions" from business operators pending a military decision. Approximately 60 such positions have been set aside by Lockheed. There is a possibility that the company will proceed with civilian production without military support. "Trade" rumours have suggested that they would do so if sufficient orders could be obtained. Should Lockheed proceed with the project, either as a result of a military contract or a management go-ahead based on prospective civil sales, it is estimated that production aeroplanes could be delivered in 15 months. The prototype Jetstars were constructed without production tooling. Estimated purchase price of the executive-model Jetstar is around $1,000,000. Production aircraft would be powered by either twin Orpheus BOr.3s, rated at 4,850 lb and built under licence by Wright as the TJ-37; by four Fairchild J83s or General Electric J85s, each rated at about 2,500 lb, or by four Pratt and Whitney JT12s, rated at 2,900 lb. At the present time the JT12 engine appears to hold a slim lead over the J85 for the proposed military Jetstar. A JT12 has been delivered to Marietta and will soon be installed in the Jetstar for flight test.

The other aircraft designed to meet the UCX specifications, the McDonnell M-119, is still shrouded in secrecy but is at least a year's development time behind the Jetstar. The M-119 will have four podded engines in the Boeing 707/DC-8 style. It is expected to make its first flight at the time of writing.

The McDonnell and Lockheed jets appear to be the sole contenders for an Air Force order for UCX transports. The Air Force would like to place an order for 20 UCX aircraft. Congressional appropriations for this purpose have been instated, cut and reinstated on several occasions. The U.S. Government has a strong moral obligation to purchase one of the aircraft, since the companies concerned have expended considerable private funds on the projects with the expectation that orders would be forthcoming if their products met the requirements. With the exception of desired purchase price—which the Air Force optimistically pegged at $400,000—it would appear that the UCX performance specifications have been fulfilled. Failure to order an aircraft at this late stage would seem to weaken the military's chances of securing industry co-operation to develop "off-the-shelf" aircraft.

Conference in a Fairchild-built F.27 executive Friendship. Like the Grumman Gulfstream, the F.27 is Dart-powered.

Decision on which UCX aircraft will be procured may hinge on the question of which company is most in need of work, rather than on relative performance. Such considerations play an important part in the award of all military contracts, and especially when a support aircraft is involved. Lockheed's Marietta facility could use a project to follow on after C-130 production. McDonnell could use additional work if their F4H (M=2.0 all-weather fighter) loses out to the Chance Vought F8U-3 in the current competition for a Navy contract.

In any event, it is likely that the eventual recipient of the Air Force UCX contract will be the first U.S. manufacturer to produce an executive jet transport. The size of the million-dollar turbine market is too limited to support profitably the development of two turbojets.

The division of the million-dollar market between turboprop and turbojet aircraft has been the subject of much discussion during the past few months. Proponents of the turbojet contend that it is the most modern form of transportation and that few people having sampled the airline turbojets will care to step down to a lower speed-level. Advocates of the turboprop, while admitting that the turbojet is in prospect for the future, utilize the argument that the Dart turboprop is a proven device. The same, they state, cannot be said for the small turbojets proposed for executive aircraft. Indeed, to hear Fairchild and Grumman salesmen extol the virtues of the Dart the unsuspecting listener might easily conclude that they were actually Rolls-Royce employees. To illustrate the importance that is attached to the Rolls name, Grumman has deviated from Vickers practice of placing the R-R. emblem on only the inboard side of the Viscount engine cowling; emblems have been affixed to both sides so that the origin of the Dart can be established by both passengers and ground personnel.

The arguments are still in progress and it will be some time before the answer is known. One of the largest U.S. multi-plane fleet operators (himself a buyer of a million-dollar turboprop) recently voiced the opinion that the turbine market would be split in the ratio of 85 per cent for the turboprop and 15 per cent for the turbojet. Although this ratio is not unreasonable the pendulum can swing in the opposite direction.

One apparent void in the heavy-twin re-equipment picture is the lack of a replacement for the twin Beech. The reason for this is that no suitable small turbines have been available, although the Lycoming T53 turboprop has been frequently mentioned in this connection. The T53 is being used in the Bell HU-1 helicopter and the Grumman AO-1 Mohawk observation aeroplane.

"The Beech Super 18 . . . sells today for $118,000."

Business Aviation in the U.S.A. . . .

The T53 is rated at 960 s.h.p. for turboprop applications. Beech themselves have considered this engine. Some months ago they released information on a design study, designated the Beech PD-112, which employed twin T53s. The paper aircraft had tricycle landing gear, a 300 m.p.h. cruise speed, 1,000 miles' range, and stand-up headroom. It was of low wing configuration. Beech did not proceed with the project because they felt the price tag —a minimum of $400,000—was too high to attract an adequate number of buyers. There is, however, considerable interest in business aviation circles in an aeroplane of this type. Beech is expected shortly to announce the development of a new business aircraft.

Completing the heavy twin field—although, like the twin Beech, it might more appropriately be classed as a medium twin—is the possible application of the North American Sabreliner. This aeroplane, designed to meet the UTX category requirement of the A.M.C. specification, is a twin turbojet, four-passenger, utility transport with essentially the same performance as the larger UCX aircraft. North American is awaiting the delivery of J85 engines, and it is expected that the prototype Sabreliner, which was rolled out some months ago, will very soon make its first flight. North American has not actively pursued the business market and no substantial executive sales are foreseen in the next few years. The Sabreliner may be too small for many operators.

The Light Twins. There has been a remarkable growth in popularity of light twins in the past five years. Needless to say, the reason is the additional safety offered by twin-engine reliability. Seating between four and eight people, and with ranges of up to 1,500 miles, the light twin is in a field extending from the $184,000, 230 m.p.h., six-place Aero Design and Eng. Corp. Alticruiser down to the $36,000, 165 m.p.h., five-seat Piper Apache.

Light twins have proved exceptionally popular among smaller U.S. firms. They are frequently flown by corporate executives themselves. Some larger firms operate light twins to supplement their heavy twins. These are used for feeder service and for trips into airports too small to accommodate the bigger types.

The light twins are of all-metal construction, with tricycle landing gear and variable-pitch airscrews, and can be equipped with comprehensive radio-navigation equipment to permit operations under all weather conditions.

Prospective purchasers of a light twin have a number of aircraft to choose from. The Aero Design company alone markets five different models of the Aero Commander. The five-place Aero Commander 500 is a recently certified, light-weight, lower-powered version of the familiar Model 560. The 500 costs $62,500 and is equipped with 250 h.p. engines. The Model 560A has 275 h.p. engines. The 560E is a long-range version of the 560A with 295 h.p. engines; it costs $78,400 and can seat up to seven. The Model 680 Commander incorporates supercharged 340 h.p. Lycoming engines and sells for $94,500. The Model 720 Alticruiser is a pressurized version of the 680 and enables more practical use to be made of the high-altitude performance of the supercharged engines. The 720 pressurization system can maintain a 9,000ft cabin altitude during cruise at altitudes of 15,000ft. The Aero Commander is the only light twin to employ a high-wing configuration. Over 600 Commanders have been sold to date, 139 of these in 1957. Numerous Commanders are used by the Army and Air Force; the military variant is designated the L-26. President Eisenhower occasionally uses an Aero Commander for trips to his home in Gettysburg, Pennsylvania.

The Twin Bonanza—now in production is the Model D50A—is a six-place aircraft which sells for $77,000. Many twin Bonanzas are in service with the Army as the L-23. Beech also produces the Travel Air, a relatively new four-place aircraft "intended to fill the gap between the Bonanza and Twin Bonanza." The Model 95, as the Travel Air is known, costs $49,500. Beech also has a licence to build the Morane Saulnier MS-760 turbojet business aircraft. They will receive two aircraft from France this year, one to be used as a demonstrator and the other to be delivered to Henry Timken, the industrialist. Substantial orders have not been forthcoming for the MS-760, although Beech noted increased interest in the aeroplane after they reduced the price from $300,000 to $210,000 in January of this year.

The Cessna 310B, perhaps the sleekest looking of the light twins, is in production for a purchase price of $59,950. Its graceful appearance alone has sold many aeroplanes. A number of Cessnas are in service with the Air Force. Over 600 Model 310s have been built. Late in 1957 Cessna dropped plans to produce the four-engine Model 620 business aeroplane. Lack of interest in a small, pressurized, four-engine piston-powered aircraft was cited.

Most popular of the light twins is the Piper Apache. With 160 h.p. engines it is the lowest priced of its class. In spite of the lack of military sales the Apache has outsold all other twins. Over 450 were assembled in 1957 alone. Piper is expected to announce shortly the development of the Aztec, a 250 h.p. version. It will sell for approximately $10,000 more than the Apache.

The Italian Piaggio Royal Gull amphibian has been produced in two versions, the L-1 and the L-2. Marketed in the U.S. by Trecker Aircraft, the L-1 is powered by 260 h.p. engines and sells for $74,000. The L-2 has supercharged 340 h.p. engines and costs over $10,000 more. In recent years maintenance costs have contributed to a general lack of interest in amphibians in the U.S., and the Royal Gull has not sold well. A seven-place, landplane version of the Gull, designated the P.166, has been flying for some time in Italy. This aeroplane will face stiff competition from the Aero Commander, which is already well established in the field.

Also in the amphibian class, some Grumman Goose G-21s and G-44 Widgeons are being used for executive transportation. A four-engine G-21 conversion produced by McKinnon Enterprises has been flying for some time. The only new amphibian in prospect is the ACME Anser. Not too much is known about the project —it is still in the mock-up stage—except that if the Anser achieves its performance specifications the Aircraft Marine Engineering Corporation of Van Nuys, California, will have accomplished major technological progress in creating a most outstanding aircraft. The Anser, it has been claimed, will transport eight passengers and baggage 1,300 miles (with reserves) for a take-off weight of 9,000 lb, which includes 680 gal of fuel. The Sabreliner, in contrast, requires a take-off weight of 15,000 lb and 850 gal to carry six passengers roughly the same distance. The Anser is estimated to sell for $200,000.

A number of de Havilland Doves are being used for corporate transportation.

No turbine aircraft have yet been announced in the light-twin field, again because of the lack of suitable small engines. The Helio Courier manufacturers, however, are understood to be working on a light twin with piston engines. Light-twin manufacturers are watching very carefully the development of the Allison 250 h.p. turbine engine. This project was the recipient of a $3,200,000 Army contract several months ago. The Allison will weigh one-fourth as much as comparable piston powerplants and will bring speeds in excess of 300 m.p.h. to the lightplane field. Approximately 40in in length and weighing only 106 lb, the Allison should find widespread application in the light-twin field.

Single-engine Types. Business operators can choose from a wide selection of aircraft in the single-engine field. Most popular designs at present are those with four seats and tricycle landing gear. The most popular aircraft are those produced by Beech, Cessna and Piper. Other manufacturers of single-engine types include Helio, Mooney, Colonial, Tusco, Taylorcraft, Forney and Champion.

The 200 m.p.h. low-wing Bonanza, with ten years of production experience and 5,600 aeroplanes built to date, is a consistent seller. The latest production model is the J35, which sells for $24,300.

Well over 5,000 Tri-Pacers have been sold. Though the Tri-Pacer is made of tubing and fabric, its low price of $8,500 and economy of operation continue to make it one of the most popular business aeroplanes. In 1957, no fewer than 1,101 Tri-Pacers were sold. Recently introduced, the roomy, all-metal Comanche is the newest of the Piper line. The Comanche is priced at about $17,000, and its good low-wing visibility and speed should contribute to substantial sales.

Cessna's line of four-seat aircraft are of all-metal, high-wing design. Slightly more expensive than the Pipers, the Cessna series are noted for their roominess, ruggedness and good interior appointments. Modern merchandizing techniques, combined with popular products, have made Cessna the largest unit producer in the industry. The Cessna line includes the Model 172, priced at $8,975; the Model 175, at $10,995; the Model 182, $14,350; and the Skylane (a de luxe, slightly faster version of the 182), $16,850. Cessna also recently announced the receipt of over 600 orders for their new Model 150, priced at $6,995. This aeroplane is a small, two-seat, tricycle replacement for the Model 140, production of which was discontinued several years ago. In August, Cessna announced the development of a Model 210, "an advanced single-engine aeroplane," a prototype of which has been flying for some

To Strike— or to Save . . .

When petroleum tankers collided in the Gulf of Oman on Saturday, 13th September, injured men were rescued from the burning tanker, "Melika", by helicopter from H.M.S. "Bulwark".

For its role as protector of all peaceful shipping and aggressor against enemy craft, the Royal Navy has lengthened its reach with Westland Whirlwind HAS 7 (anti-submarine) helicopters. These are powered by Alvis Leonides Major engines.

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He is in his office, all the necessary papers are to hand. He is travelling at nearly three miles a minute.

He is in the Company's executive aircraft, a Heron, fully equipped, four-engined. He finds it economical; his own time is more expensive than most things.

The de Havilland HERON Executive Aircraft

powered by four de Havilland Gipsy Queen engines driving de Havilland propellers

Business Aviation in the U.S.A. . . .

time. Cessna's best seller is the 172; no fewer than 939 were sold in 1957.

The Helio Courier boasts remarkable safety for a single-engine aeroplane; it can follow a helicopter landing pattern and land on small heliports. Many Couriers have been sold to bush operators outside the U.S.A. Thirty-three were built in 1957.

A modernized version of the Navion will be marketed in the near future by the Tusco Corporation of Galveston, Texas. The aeroplane will be called the Navion D and sell for approximately $20,000.

The four-place Colonial C-2 Skimmer is the only small amphibian being produced in the U.S. Its excellent water handling characteristics have made it popular among seaplane pilots. About 25 C-1 and C-2 Skimmers have been assembled. The C-2 sells for approximately $22,000.

Helicopters. Helicopters have yet to realize their potential in executive transportation. Many piston-powered Bells and Hilers are at work for companies in transport rôles, but most machines are used for charter, utility and agricultural duty. High purchase-price, operational costs, vibration, some passenger reluctance, and expensive flight instruction have delayed acceptance of the helicopter. To overcome the high cost of operation some firms have banded together to form helicopter pools. A successful example of this arrangement is the operation conducted by Helicopter Air Lift of Chicago. Some 30 user companies share their five helicopters. Short trip-times simplify demands for availability.

The turbine engine may serve to advance the use of helicopters for corporate transportation. The Sud Aviation Alouette, marketed by Republic Aviation in the U.S. for $90,000 with radio, is the only turbine-powered civil helicopter currently available. Its smooth flight and minimum down-time have appealed to operators.

An executive version of the Bell HU-1 helicopter will be produced as Model 204. Powered by a T53, the 204 will carry six people. Bell's unparalleled reputation in the helicopter field should help to win acceptance of the 204.

Flying Aids. To maintain service comparable to that of the airlines, business aircraft must fly in adverse weather. Nearly all large business aeroplanes are fully equipped for I.F.R. operation, some with more complete equipment than airliners. Dual electronics (A.D.F., Omni, D.M.E. and communication) and I.L.S. receivers are standard on most heavy twins. Approach-coupled autopilots, weather radar and, of course, full de-icing equipment, are commonplace. One large New York-based operator reported that he completed over 96 per cent of his scheduled flights during the past year.

The completeness of navigation aids in light twins rivals that of bigger aircraft. RCA offers weather radar for light twins. Owners of single-engine aircraft are also spending large sums of money on electronics, and it is not unusual to find a $12,000 aeroplane with $3,000 worth of electronics and flying aids.

The leading avionics producers are Aircraft Radio Corp., Bendix Radio, Collins, Dare, Lear, Narco and RCA. Transistors are appearing more frequently in new equipment, having established a record for improved reliability. Avionics sales and service shops are experiencing a boom.

Increased flying activity and faster planes are making the air traffic problem even more critical than before. Business I.F.R. flights are being forced to higher and higher altitudes, where the lack of pressurization is a handicap. Advocates of positive air control predict that all airspace above 5,000ft will eventually be reserved for I.F.R. flights. They point out that in the U.S. there has not been a mid-air collision between two aircraft under positive control for over ten years. The Grand Canyon tragedy in 1956 occurred between two aeroplanes that were not flying under positive control. The concern over mid-air collisions has prompted many manufacturers to work on the development of collision warning and avoidance systems. Operators of large aircraft are willing to accept co-operative systems, but many small-craft owners feel they cannot afford the necessary equipment.

All operators are watching the Airways Modernization Board to see what collision-avoidance system they will recommend.

The forthcoming I.C.A.O. meeting in Montreal next spring is being watched by avionics manufacturers and operators alike. Those with new turbine equipment on order are particularly interested in the outcome of the VORTAC *versus* Decca/Dectra controversy. Some experimentation has been performed in the U.S. with various Doppler devices, but until these get within the financial realm of general aviation their use will be severely limited.

In the meantime, many operators are resorting to high-conspicuity paints to increase the range at which their aircraft may be seen by others. All 92 C.A.A.-owned aircraft are being so painted, and many business aircraft have already been treated with liberal splashes of this paint.

Charter Services. As a supplementary activity some fixed-base operators and flight schools provide air-taxi or charter services for executives. Offering a choice of single-engine or light-twin transportation, they serve those companies who have insufficient justification to own and operate an aeroplane.

An interesting charter plan has been put into effect by the Hertz U-Drive-It organization. Through Cessna dealers and taxi operators Hertz has developed a "U-Fly-It" service. Once checked-out on a specific type, a pilot can rent an aeroplane at any Hertz outlet and fly it to any other station. He need not return it to its original base. For those who have not yet qualified as pilots the plan operates as a normal charter service. Cessna will undoubtedly benefit from this programme, since pilots who get accustomed to flying Cessnas will be good prospects for future sales.

Also available to non-owners are rental plans whereby a firm can lease an executive aircraft for a month at a time. A pilot is provided if necessary. Some aircraft manufacturers have lease plans which make rental charges deductible from the sales price in the event of a subsequent purchase.

Leasing arrangements have proved popular because many operators are not interested in the problems of maintenance, hangarage, etc. They are frequently willing to have an outside party assume these burdens, and merely pay a fixed charge per month plus a known charge per flight hour. It is understood that one major U.S. airline is considering the purchase of 30 heavy-twin engine turbine aircraft to implement a charter plan.

Conclusion. No longer will the travelling executive have to fly in surplus military aircraft. Business aviation is on the brink of the turbine era, and some heavy-twin executive aircraft are already coming off the production lines. Light twins may soon be equipped with turbines, and single-engine turbine aeroplanes may also ultimately be produced. The introduction of turbines to the business fleets, however, will not be accomplished without some problems.

Aircraft versatility may be compromised by the problem of airport suitability. Turbojet operators must consider not only the length of runways, but also the cleanliness of runways and taxiways. Foreign-object ingestion by a turbojet may require premature engine overhauls, or even cause engine destruction.

Operators of both types of turbines will be, for a time, faced with the problem of turbine fuel availability at secondary airports. Increased fuel consumptions of turbine aircraft may offset some of the benefits of cheaper fuels. Owners of new turbine aircraft will have to pay higher-than-average insurance rates because of the lack of demonstrated safety records of turbine aircraft.

Pilots must pay greater attention to fuel scheduling, runway gradients and temperature accountability. Since cruise speeds will be significantly greater and check points closer together, a greater percentage of the trip time will be devoted to navigation. More than ever before, the autopilot will be a pilot's best friend. Reduced pilot fatigue, however, should result from the turbines' vibrationless flight and shorter trip times.

Maintenance personnel must broaden their knowledge. Not only will mechanics have to learn about entirely new aircraft, but they will be required to maintain additional, unfamiliar systems as well. Pressurization systems, speed brakes and auxiliary power units will be new to most maintenance personnel. Because of increased touch-down speeds, tyre and brake wear will be accelerated, and replacements may be needed more frequently than before. During the initial year of turbine operation, the business operator, like the airlines, will have higher maintenance bills as ground personnel become acquainted with their new aircraft. Flight personnel will also cause additional expenses as flight training will be required on all new turbine aircraft.

Management will find that hourly operating costs will soar, and even costs per mile will increase. Formerly a piston-powered aeroplane covered a certain number of trips in a given year. Now those same trips can be completed in much less time. If the number of trips flown remains unchanged, hourly flight costs will skyrocket, since so much of the ownership charges are the fixed costs of insurance, hangarage, salaries and depreciation. It will be interesting to see whether the new aircraft are used merely to fly the same number of trips in less time, or if the travel scope will be broadened to fly more trips in the same total number of hours.

The challenging problems posed by turbines will be met, because the rewards are considerable. Reduced travel time, vibrationless flight and freedom from weather delays will set new standards of comfort and utility that should stimulate more business concerns to participate in the benefits of flying on the "custom airlines" of the U.S.A.

"Over 600 Cessna Model 310s have been built."

1

2

3

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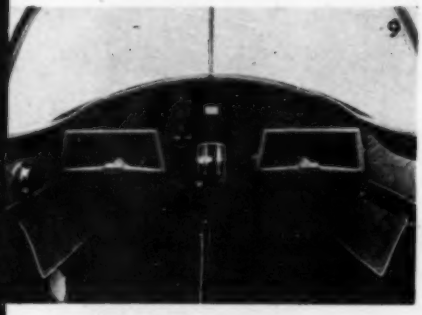
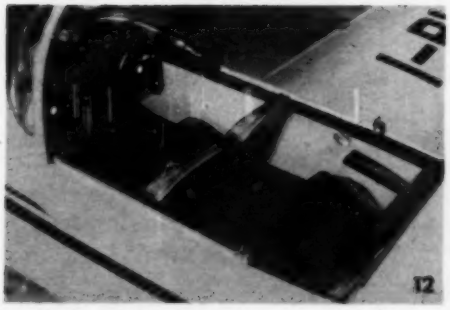
BUSINESS and PLEASURE





1 *Cessna 310B.*

2 *de Havilland Heron Standard Executive.*

3 *Morane Saulnier MS.760 Paris.*

4 *Hunting Executive President.*

5 *Super Aero.*

6 *Trecker Gull (Piaggio P.136L).*

7 *Bell Ranger.*

8 *Trecker Gull (Piaggio P.136L).*

9 *Forney Aircoupe.*

10 *Bell Ranger.*

11 *Nardi FN.333.*

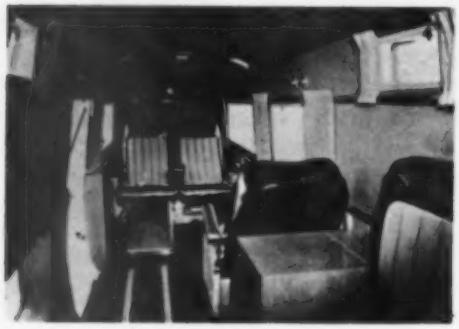
12 *Piaggio P.149D.*

1 *Convair interior by L. B. Smith.*

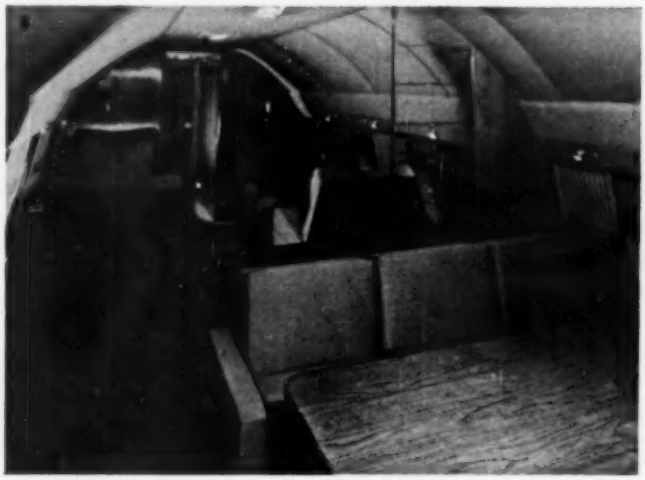
2 *PacAero Learstar Mk. II interior.*

Executive travel à l'Américaine

3 *Viscount boardroom by L. B. Smith.*



4 *On Mark Marketeer interior.*

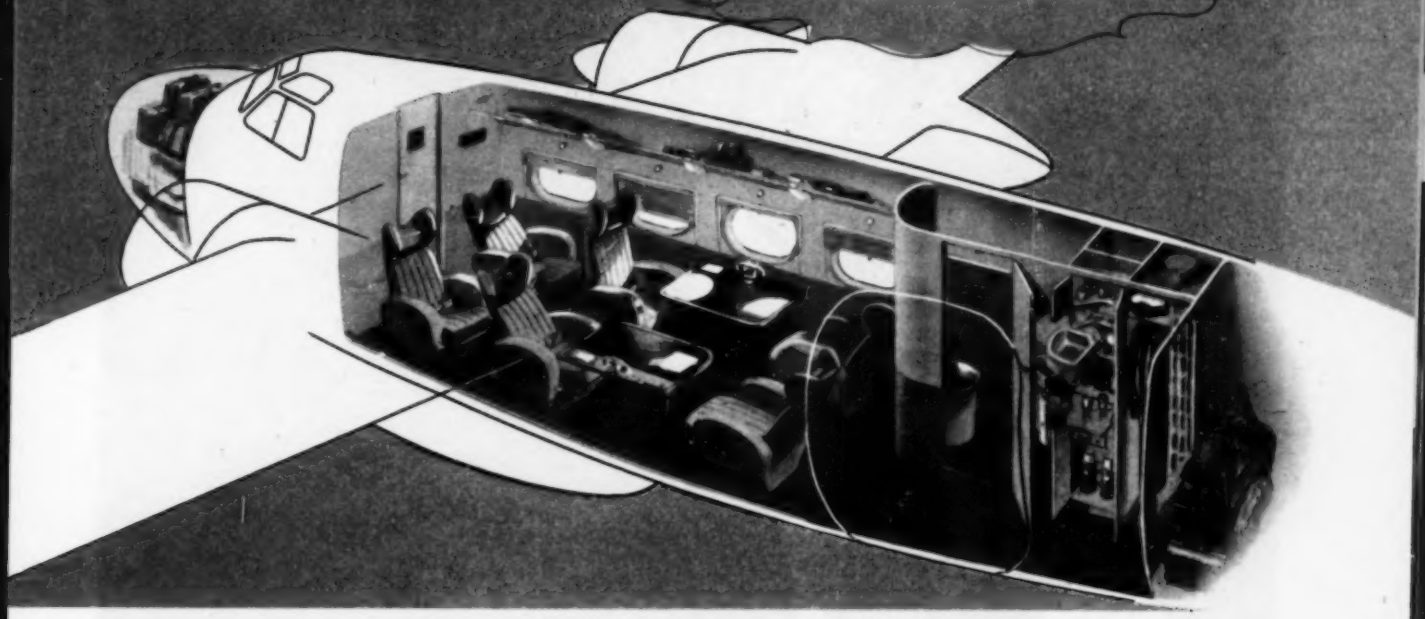


5 *Jetstar executive aircraft by Lockheed; twin Orpheus turbojets by Bristol.*

THE EXECUTIVE

President

Two Alvis "Leonides" Engines



EXECUTIVE AND CHARTER AIRCRAFT

✳ *Increased Performance*

✳ *Greater Range*

✳ *Proven Reliability*

Civil counterpart of the Pembroke—in service with the Air Forces of seven nations

ACCOMMODATION 6 passengers, their luggage, and a crew of two. Other versions of the President have accommodation for 12 passengers.

PERFORMANCE Take-off distance to 50 ft. (15 m.) 2250 ft. (686 m.)
Cruising speed 204 m.p.h. (328 km/hr.)
Stage lengths up to 1555 miles (2490 kms.) can be flown with reserve fuel for 30 minutes stand off.

The executive President is a personal airliner for the business man — the man of industry — the man who has no time to waste .....

HUNTING AIRCRAFT LIMITED

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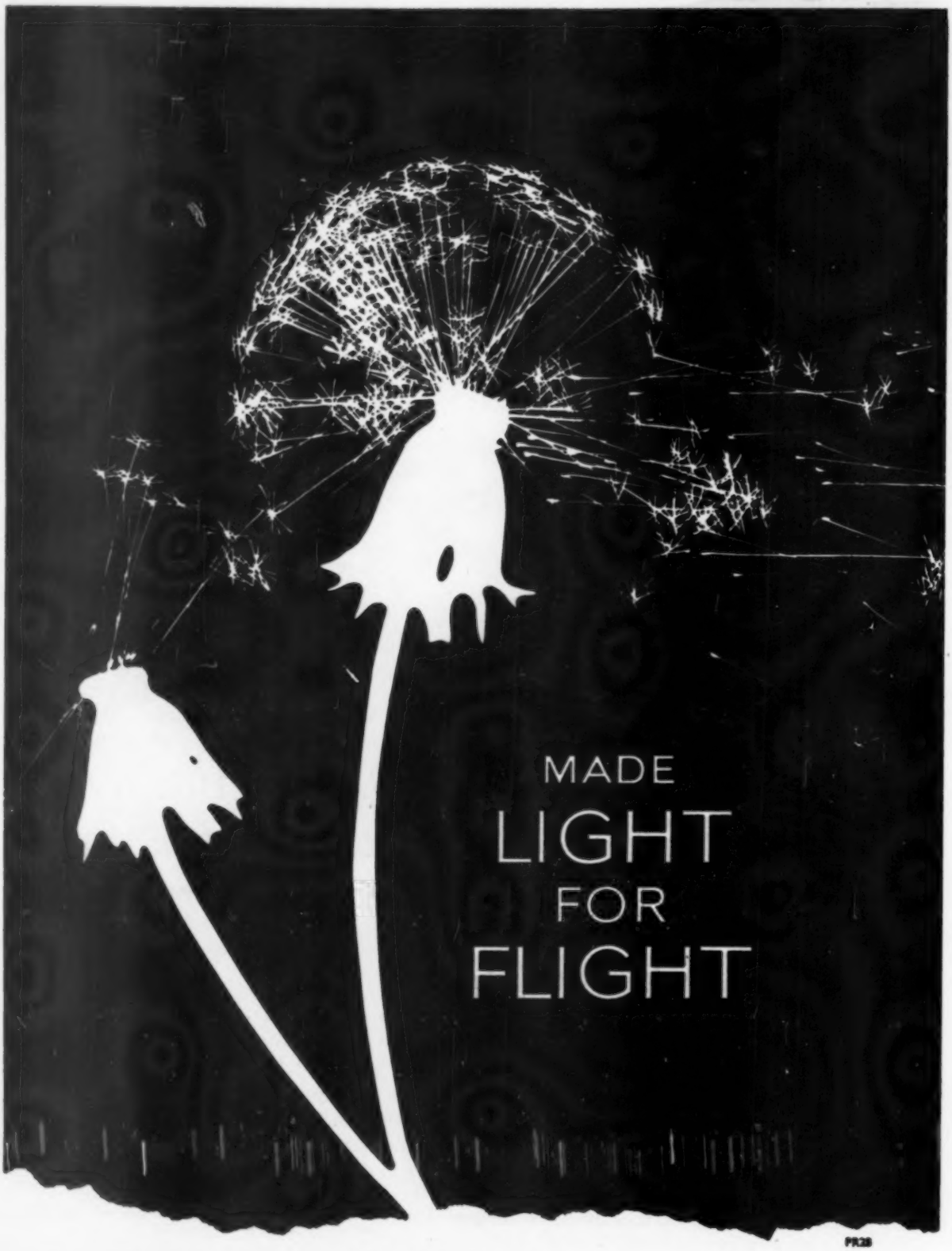


DAGENITE AIRCRAFT BATTERIES

PETO AND RADFORD, 187 VICTORIA STREET, LONDON, S.W.1.

Aero Commander 500, Beech Bonanza and cabin mock-ups in a sidewalk display opposite the City Hall in Philadelphia.

CIVIL SHOW

Business and Executive Types at a "Private Aviation Farnborough" in the U.S.

AN impressive static and flying display of new business aircraft (writes an American correspondent) highlighted the 11th annual meeting and forum of the National Business Aircraft Association in Philadelphia on September 22, 23 and 24.

The N.B.A.A., whose membership includes 450 corporations that between them operate over 1,500 business aircraft, sponsors this annual event. Company executives, chief pilots and sales managers attended the three-day session to discuss common problems, share know-how and see the displays of sixty-four of the leading manufacturers. The programme included forums and displays in the Bellevue-Stratford Hotel, aircraft exhibits in the city itself and at the airport, and an air show.

The meetings discussed the new N.B.A.A. operator's manual and the Weather Bureau's "five-year plan." The 857 members and guests also attended engine symposiums and a forum on traffic-control problems.

Across from City Hall in downtown Philadelphia was a sidewalk display of seven aircraft and a helicopter. Thousands of passers-by examined the Tri-Pacer, Comanche, Apache, Cessna 175, Cessna 310B, Bell Ranger and a shiny new Aero Commander 500. Particular attention was focused upon Beech Bonanza No. N35U, which was flown recently by Pat Boling on a record-breaking 7,090-mile trip from Manila to Pendleton, Oregon. Cabin mock-ups of the Mooney Mk 20A and Twin Bonanza led one puzzled citizen to remark to his companion, "But how does it fly?" His friend replied knowingly, "They put wings on it."

The three days of conferences were spiced with socials and banquets. The keynote banquet speakers were Senator "Mike" Monroney, author of the Federal Aviation Agency bill; Louis Hector, newest member of the Civil Aeronautics Board; and Dr. Ned Dearborn, head of the National Safety Council.

Senator Monroney, who frequently travels in a Cessna 172, spoke on the subject of the F.A.A. and the airport aid bill. Citing the need for more federal aid to airports, he stated that only seven U.S. civil airports were suitable for handling the new jet transports—and some of these were unfit for cross-wind operations.

Louis Hector explained that under the provisions of the F.A.A., rule-making and enforcement will be made by the F.A.A., but accident investigations will still be conducted by the C.A.B.

Ned Dearborn congratulated the winners of the annual N.B.A.A. safety awards. Cited for having flown more than a million miles, each without accident or injury, were 48 corporate members of the N.B.A.A. Sperry, Goodyear and Monsanto Chemical had each flown more than five million consecutive accident-free miles. Fifty-five corporate pilots received certificates for having flown more than a million safe miles.

The afternoon of the last day of the meeting was devoted to a ground and air show at Philadelphia International Airport. After a luncheon in an Atlantic Aviation hangar, delegates climbed in and out of 24 different business aircraft and nine helicopters on exhibition. Beech showed five models, including the turbojet MS760 owned by Timken Roller Bearing. Aero Design, Cessna and Piper showed three models each. Conversions attracting attention were the Howard Super Ventura, the On Mark B-26, and Oakland Airmotive's Centaurus—a Lockheed PV-2 Harpoon conversion with R2800 engines. The Centaurus sells for $152,000, less radio and interior.

Frederick B. Ayer and Associates, Inc., had a polished Convair 240, one of 24 recently purchased from American Airlines. It is offered in airline configuration for only $250,000, or, in an increased-range version with executive interior, for $385,000. Parked nearby was the Allison-powered Convair, a model which is offered as a conversion by Pacific Airmotive for approximately $700,000.

The greatest attractions were the new turbine trio: the Lockheed Jetstar, Fairchild F-27, and Grumman Gulfstream. In Piedmont Airlines livery, the F-27 gave demonstration rides to N.B.A.A. visitors on all three days.

The rotary-wing industry was well represented with the latest machines from Bell, Hiller, Omega, Republic, Sikorsky and Vertol.

Not part of the show, but nevertheless of interest, were the 94 corporate aircraft that brought many of the delegates to Philadelphia. The tie-down area was crowded with DC-3s, Lodestars, Learstars, Beechs, Cessnas, Pipers, Commanders and Doves. Amphibians present were the Colonial Skimmer, Trecker Gull, Grumman Mallard and a venerable Consolidated PBY. Douglas No. N1, a DC-3 owned by the C.A.A., carried the largest area of "glow" paint yet seen anywhere.

While helicopters danced in front of the reviewing stand, each aircraft in turn made a take-off, a fly-by, and a landing. Each helicopter pilot seemed intent upon surpassing his competitors, although the T58-powered Sikorsky S-62 subtly pranced about in all directions only a few inches off the ground. Vertol paraded a model 44, a model 76, and a twin T-58 model 107. Three Commanders, a 500, a 680E and an Alticruiser, flew past the crowd in formation. The remarkable Helio Courier provided a spectacular demonstration of low-speed manœuvrability, in strong contrast to the high-speed passes of the Gulfstream and Jetstar. Upon completing its demonstration, the Mooney Mk 20 came in for a landing behind an airline Constellation. Violent turbulence flipped the Mooney on its back, but the pilot was able to effect recovery without injury.

During the course of the convention it was learned that the Cessna 210, a high-wing, four-place airplane with retractable tricycle gear, will be available in the middle of 1959. It is characterized by a swept-back fin. An interesting light twin that will be available early next year is Oakland Airmotive's Super V, a converted Bonanza with two slim fuel-injection Lycoming O-340 engines. The Super V will sell for $27,500, using rebuilt airframes.

Lockheed seems increasingly inclined to produce the Jetstar commercially, irrespective of Government action on the UCX competition. It appears probable that the Jetstar will be powered by four P. and W. JT-12 engines. If Lockheed proceeds with commercial production first deliveries would start in mid-1960. The UCX decision is apparently awaiting the flight of the McDonnell 119 early next year. Lockheed is reserving 63 delivery positions for civil Jetstars. Sales price of the Jetstar, with engines and airline-type interior but less electronics, will be "about a million dollars."

Fairchild announced that the price of the F-27 has been increased to $635,000 and that the F-27A (RDa.7/2 engines) has been upped to $695,000. The price of the Grumman Gulfstream, which had been targeted at $700,000, has now been established at $845,000, less electronics and interior.

The wide selection of large business aircraft available raises a serious question of market saturation. It is problematical if all competitors can profitably participate. Four years ago operators were bemoaning the lack of large aircraft designed for business use. There were no such comments at Philadelphia this year.

At the airport: Left, Sikorsky S-62 with Vertol 44 in the background; right, Grumman Gulfstream and (at rear) Lockheed Jetstar.

The British Scene

PRIVATE FLYING UNDER HANDICAP: IS THERE HOPE FOR THE FUTURE?

IN September of this year there were 1,121 aircraft on the British Register employed in business, independent charter, club, group and private operation, out of a total civil fleet of 1,717. This is quite an impressive proportion of the whole, as well as being a reasonable number of aeroplanes. The totals come down rather abruptly, however, if we consider only those aircraft with a current C. of A.—908 out of 1,378.

An analysis of corresponding figures last April shows a more gloomy state of affairs than might be deduced from the totals: of the aircraft in the categories listed above, some 1,200 altogether, only 129 date from 1948 or later. Of these 98 are Austers—the most numerous type on the full list, with 294 of various marks. There were 225 Tiger Moths (a 27-year-old design), 96 Proctors (basically 23 years old), 80 Rapides (24 years old), 66 Doves (11 years), 60 Geminis (13 years), 55 Chipmunks (12 years) and 50 Messengers (16 years). Furthermore, it should be borne in mind that the basic design of the Auster dates from 1939.

At the end of 1957 there were about 65,000 comparable aircraft in the United States, flying ten million miles a year. The majority of these were single-engined. Purely executive, as opposed to charter, freight and taxi-work aircraft, totalled about 25,000 of the whole. In France, there are 2,264 club, private, charter and amateur-constructed aeroplanes. We have 908.

That is the position; although a very substantial majority of the civil aircraft of this country are private or business ones, almost all are of war-time or pre-war design. Many of these may be removed in the near future under the provisions of Notice 50 of the Air Registration Board as a result of investigations into the state of laminated wooden structures assembled under the relaxed conditions of war-time.

At the moment there does not appear very much hope that the aircraft industry will make any attempt to turn to the design and construction of a new and up-to-date type of executive aircraft. Wedded as they are to the system of Ministry of Supply contracts on a cost-plus basis for the production of enormously expensive aeroplanes, none of the existing firms could hope, with their current scale of overheads, to turn out a light aircraft of even the simplest type at less than about £6,000, which is a manifestly absurd price. The only alternative, to attempt to construct an American type under licence, would be an abject admission of failure. In any case, as there is no suitable new powerplant to replace the Gipsy Major, we should be dependent on American engines.

This general disinclination to take any interest in the future of light aviation is echoed, though for other reasons, by the Ministry of Transport and Civil Aviation. It would be foolish to suggest that we crave necessarily the type of financial support offered by Dominion and foreign governments to their private pilots and constructors—such a system would not, in fact, be generally desirable here—and churlish to deny that much understanding and sympathy is shown our cause by more than one department of the M.T.C.A. But it is impossible for a reasonable person to regard the current legislation and its interpretation at high level as anything but inimical to private and business flying. From the establishment of V.M.C. minima to the regulations governing the facilities of both used and disused aerodromes, the majority of rulings are made with little or no regard to the needs of a body representing two-thirds of the civil air fleet.

When one recalls the outcry, many years ago, over the fact that Sir Winston (then Mr.) Churchill combined his aviation responsibilities with those of another department, it seems odd that no move has been made to separate the Civil Aviation side of the Ministry from its dependence on other and older modes of transport. Even without so sweeping a change, there is one improvement well within the capabilities of the Ministry. In France, as part of the Civil Service, there is a department of their M.T.C.A. called S.F.A.S.A.—the Services des Formations Aéronautiques et Sports Aeriens. Responsible for the advancement of sporting flying, it is governed by a Civil Servant who has been an active pilot since 1930. He is to be seen and heard at most French sporting aviation meetings and comes to England from time to time to see what we are doing. One hopes he is not too disappointed. Among the items on his programme are the building of *stations air-route*, which are airstrips, with fuel and food and (ultimately) hotel facilities, alongside main roads. Four have already been built. Another scheme under consideration concerns government ordering of pre-production batches of promising prototype light aircraft, to help builders over the financially difficult gap between prototype and orders.

But the situation in Great Britain is not entirely hopeless. As a result of a symposium held some time ago by the Royal Aero Club, at which various Ministries and private interests were represented, 78 Royal Air Force aerodromes have been placed on a joint-user basis and concessions have been granted over the use of Ministry aerodromes after hours. The arguments over interpretations of aerodrome control that crop up from time to time are always sympathetically heard and amicably settled. (We might mention, as an example of the friendly competence displayed towards light aircraft passing through Control Zones, the work of the controllers at Eastleigh. On several recent trips through there the writer found the handling first class.) Nevertheless, it is a great pity that one has so often to be arguing and asking for concessions from the authority responsible for our operations.

What of tomorrow? The supply of aircraft in the near future is, if not assured, at least partially guaranteed by the continued production of Austers of classic design; by the construction of several French and British ultra-light designs, intended to cheapen the costs of flying (the Linnet, Emeraude, Turbulent, Turbi, Condor, Luton Minor and Major and Jodel fall within this category); by the modification of a pre-war airframe to extend greatly its useful application (the Thruxton Jackaroo); and by at least two entirely new designs, both still in the earliest stages of construction. All these schemes, however praiseworthy and effective now, are simply palliatives. None seems likely to solve the basic problem confronting this country.

This problem is, quite simply, that in order to ensure the future of light aviation, of the industry supporting it and of the supply of pilots, it is necessary that we should produce an aircraft which will compete successfully with current American designs. That there exists a design capability in the industry is self-evident. There is a market in the Commonwealth, in Europe and in South America which would ensure orders sufficient for an adequate production run (according to the estimates of a number of business pilots who have recently examined these areas with a reasonably critical eye); and only the incentive, the vision and the necessary finance seem to be lacking. Here, if anywhere, is the place to apply a little Governmental urge. An order of, say, 200 airframes for sale at reasonable rates to clubs would go far to putting the movement back on its feet.

What the Private Owner Wants

From recent discussions it has been possible to forecast the type of aircraft that the private and business pilot would like to see. The general layout is a low-wing monoplane, seating two, side-by-side in a cabin with dual control. On the subject of two-seater or four-seater opinion is divided, but the popularity and economy of the two-seater has been effectively demonstrated on the Continent. Development to a four-seater is possible later. The engine would be a flat four or six (probably six) of about 150 h.p., the cruising speed at least 120 m.p.h. and the endurance 4½ to 5 hours. With full tanks, it should be possible to stow at least 50 lb of luggage (extra tanks in place of this would give a maximum range of about 700 miles). These appear to be the minimum performance parameters of any successful design. Regarding equipment, it is the writer's opinion that a starter and generator are essential; but, in order to maintain a reasonable basic price, radio and full panel would probably have to be optional extras, though the panel is a useful adjunct at all times.

In spite of the many advantages, in this country, of a steel-tube and fabric construction, it will probably be essential to design an all-metal aeroplane, certainly with flaps and probably with a tricycle undercarriage. It is not easy to canvass opinion in the United Kingdom on the more modern types of aircraft, as very few people have any experience of them, but the American trend in design is now dominating the market, so metal skins and tricycles may be essential on those grounds alone. For similar reasons it may be essential to produce a four- rather than a two-seater fairly quickly.

The provision of radio raises a number of problems. To equip oneself with only a V.H.F. set with a limited number of channels and then to employ it to the maximum is an expensive process, and to add the cost of M.F. equipment, A.D.F. and radio compasses makes the whole scheme almost prohibitive. It is to be hoped that the recent announcements of dollar-purchase easements will include not only permission to buy modern aircraft but light, transistorized radios at reasonable prices. A substantial order for sets to equip the production run we have envisaged for a new aircraft would go far to reduce the price—alternatively, some of the inexpensive foreign sets might be granted approval.

Whatever the methods adopted, if the restoration of the light aircraft industry and movement in this country is not undertaken soon, it will be too late. The citizen of Great Britain has a right to fly if he wants to; but, starved of support, equipment and much of his freedom, there is very little he can do about it—at the moment.

JOHN BLAKE

THE FLYING BREWERS

Mr. G. B. Thorley, director and chairman, Ind Coope committee of management, enters the company's Dove.

THAT business flying is "no longer an experiment, but a necessity" is the experience of a famous firm of brewers. In this article an executive of the company explains why, and quotes operating costs and results.

THE expansion and development of the brewing industry in recent years has meant an increasing amount of travel for the various brewers' directors and senior executives, not only in the British Isles but, in some cases, to the Continent or even farther afield.

A case in point is the Ind Coope Group. In these islands, for instance, we have breweries at Alloa in Scotland, Wrexham in Wales, Burton, Romford and Watford in England, and at Dundalk in Eire. They are self-contained units which must be visited very frequently by the Group's directors, executives and technicians. Besides these main breweries there are a number of agencies and depots to be visited from time to time. Planning, building, or rebuilding and re-styling of hotels, inns and public houses—of which the Group operates over 4,000—are other matters which call for personal attention.

The speed of travel is of the greatest importance if decisions are to be taken and work to be put in hand at considerable distances from the main brewery at Burton. It has always been obvious to us that long periods in trains or in cars not only waste the time of directors and senior staff, but also cause considerable fatigue, so that after a long and tedious journey an executive is not as fresh to carry out the work he has come to do. Furthermore, speed really can, and does, make money. In property matters, for instance, a director can go and see for himself and thereby take on-the-spot decisions which may show a return comparable with the cost of operating an aircraft for a whole year.

For these reasons, but especially on the score of saving time and avoiding fatigue, we first began to use charter aircraft and then our own Gemini. The latter, flown by one of our directors, or by a part-time pilot, also often carried the technical director, whose duties included visiting the Group's properties all over the country.

Having decided that a true executive aircraft would be well worth while, we had to seek the right type, and one which could use existing airway systems and control zones. We also engaged as aircraft captain an ex-R.A.F. fighter pilot, Capt. David Lancaster, who had flown on charter work after the war. He held the necessary licences, and not only had experience of the type of flying required but also had a background which embraced other operational aspects, such as maintenance, running costs and aircraft utilization.

We decided on the following criteria for our projected aircraft: twin engines of proven reliability; six armchair-type seats; ability to operate from small fields; ability to carry the necessary radio equipment and navigational aids for all-weather flying; reasonable operating costs; reasonable purchase price; and availability.

The aircraft eventually chosen was a de Havilland Rapide which, although obsolete and slow, fulfilled our requirements and in its first operational year for us logged 650 flying hours. Its achievements were: passengers carried, 1,102; passenger mileage, 120,000; utilization, 183 days out of 200; aircraft miles, 70,000. During that year, incidentally, the Suez crisis occurred and a voluntary restriction of 20 per cent in operations was observed for three months.

Our experience with the Rapide led us in 1957 to purchase a de Havilland Dove, which fulfilled the same basic requirements. Furthermore, its average airspeed—roughly 175 m.p.h.—was considerably higher than that of the older aircraft. The Dove offered many other advantages, not the least of them its longer range. This meant a considerable saving in the time taken in refuelling and, by the same token, fewer landings at approximately £2 14s a time. The Dove would also be able to operate more successfully than the Rapide in winter, owing to its de-icing equipment and up-to-date radio and navigational aids, which include a Decca Navigator. Apart from technical improvements, there was greater comfort for passengers and crew.

But the question we all asked ourselves was the inevitable "Is it worth it?" It was obvious that little could be done about "static" items, including the cost of the aircraft itself, depreciation, hangarage and annual C. of A. expenses, but that a considerable amount could be cut from the hourly operating costs. Maintenance, for instance, has been costing us £4 an hour and average landing fees £3 5s in every hour. To cut these we propose to lease our own aerodrome at Tatenhill and engage our own maintenance engineer, thereby cutting the first item to £2 an hour and landing fees to £2 10s an hour. In addition, there will be a substantial saving in hangarage and handling charges. We shall also arrange for the maintenance to be done at week-ends, when the aircraft is not normally used, enabling it to carry out a full working week's flying.

Current operating costs, without depreciation and assuming 600 hr flying a year, are approximately 2s 10d per aircraft mile. When flying 700 or 800 hr a year the costs are reduced to 2s 9d and 2s 8d respectively. Operating costs (without depreciation) at Tatenhill will be: 2s 6d, 2s 4½d and 2s 3d per mile at, respectively, 600, 700 and 800 hr annually. In the first six months of its operation our Dove has carried an average number of 2½ passengers on every flight. Costs have worked out, therefore, at 1s per passenger-mile.

Another factor of importance was to make sure that the aircraft was well and intelligently used, so we set up our own booking and reservation system.

In the first 26 weeks (130 working days), allowing for maintenance, the aircraft was available for 124 days, on 119 of which it was used. During this period our utilization was: 568 passengers carried; 384 journeys; 47,189 aircraft miles flown; 293 flying hours logged; 79,890 passenger miles covered; 13,474 non-productive miles covered; 509 passenger hours logged; and 390 landings made, using 42 different aerodromes.

Of the 390 landings, 32 were at R.A.F. airfields, 100 were in the London area, 38 were at Southend, and 116 were at Burnaston, Derby.

As an example of one day's flying, the Dove took off from Burnaston, Derby, at 0745 hr and landed for the night at Cardiff at 1810 hr after covering 900 miles in ten "hops," as follows: Burnaston to Tangmere, Tangmere to Croydon, Croydon to Burnaston, Burnaston to Chester, Chester to Liverpool, Liverpool to Dublin, Dublin to Cardiff.

Thanks mainly to the Royal Air Force, aerodrome availability in the U.K. is good. A great help is the fact that many R.A.F. stations allow civil aircraft to land, subject to the commanding officer's permission and provided the landing is made during normal working hours. But a very disturbing question at present for commercial and executive enterprises is the threatened closure of Croydon Airport, so soon after the loss of Hendon. How serious this is for us can be judged from the fact that we landed at Croydon 120 times during our first year of Dove operation. Obviously, the availability of landing fields in the immediate London area is of the greatest importance. There is already congestion at London Airport, and both this airport and Gatwick are too far out of London. Apart from the matter of distance, Gatwick does not appear to have a good weather record, and so long as there is only one runway it is likely to build up its own operational congestion. At the moment, and unless the Minister can be prevailed upon to have second thoughts about Croydon, the outlook for executive and private flying in the London area is a gloomy one.

Nevertheless, our experience has taught us, especially in view of our widespread interests, that business flying is no longer an experiment; it is a necessity.

"The Dove offered many other advantages . . . longer range, greater comfort for passengers and crew."

Above, Beechcraft Twin Bonanza; below, Beechcraft Bonanza.

Cessna 150.

Cessna 172.

Cessna 175.

BUSINESS AND TOURING AIRCRAFT (contd. from p. 582)

Cessna

150 The 150 is the smallest of the Cessna range. The engine is a Continental O-200-A of 100 h.p. and seating is for two, side by side. The undercarriage has a steerable nosewheel and, like other members of the Cessna family, the 150 is of all-metal construction. The type is offered in three versions, the standard model, a trainer and a "commuter." Exterior styling is available in three choices of colour: "forest green," "damask red" and "colonial blue." Special high-intensity fluorescent paint is available at additional cost.

The 150 is now going into production. The initial run will total 715—and every one has been sold.

172 This is a four-seater powered with a Continental O-300-A engine of 145 h.p. driving a metal fixed-pitch propeller. The type is regularly sold to people who have no previous flying experience and who, with the assistance of an instructor, qualify after a few days of ownership. There are two adjustable seats at the front and a bench for two at the rear, and the cabin is comfortably furnished, sound-proofed and equipped with coathangers, cigarette lighter, windshield de-frosting and heating.

Like all Cessnas, the 172 has an all-metal, flush-riveted airframe with exceptionally low drag. Wings are provided with high-lift slotted flaps and a stall-warning system, and the undercarriage comprises a "Land-O-Matic" main gear with spring-steel suspension and disc brakes, and fully steerable nosewheel with which the aircraft can be turned round on a taxi-strip less than 30ft wide.

175 The 175 resembles the 172 but has a higher performance, conferred by a geared Continental GO-300-A engine of 175 h.p. Fuel capacity is greater (52 U.S. gal instead of 42 U.S. gal). It is planned to build 744 of these aircraft in the initial production run, and the company has already received orders for 652.

Our American contemporary *Flight Magazine* reports that the type "will find a ready market for aircraft users who would like more than the popular Model 172 offers but who are not ready or able to advance all the way up to the model 180-182 series with its still higher performance and costs." Another way to classify the new 175, the journal states, is to view it as almost filling the performance gap left vacant by the 205 h.p. Navion, which has held the 140 m.p.h. cruising category to itself since it went out of production.

180 Characterized by a tailwheel undercarriage, the 180 is a four-seater, powered with a Continental O-470-K engine of 230 h.p. Since deliveries began in February 1953 no fewer than 3,340 have been sold. Standard equipment includes castering wheels and the type is available with skis or floats.

182 This model dates from March 1956 and is essentially a 180 with additional sound-proofing, revised powerplant installation and steerable nosewheel undercarriage. The engine is a Continental O-470-L of 230 h.p., driving an all-metal constant-speed propeller.

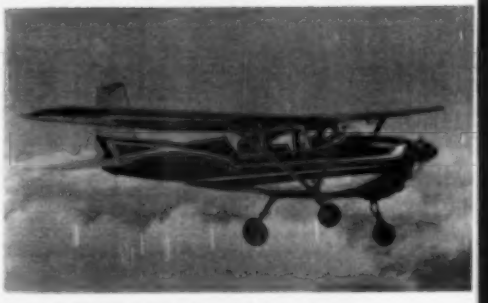
Skylane The Skylane is a de-luxe version of the 182, with a slightly higher performance. Wheel fairings are standard, contributing both to performance and appearance.

310B This is the largest of the Cessna range, being a five-seater twin-engined all-metal monoplane. The power units are Continental O-470-Ms of 240 h.p. It is not inappropriate to allow the manufacturers to describe the 310B in their own terms. Their catalogue reads: "If you prefer a relaxing way to hurry, make your next business trip in a new 310B. The spacious interior has been engineered to provide the finest in quiet, restful comfort, executed in glove-soft leathers and carefully loomed fabrics. Every effort has been made to provide an atmosphere nothing short of an 'office' in the sky, a place to think and plan . . . a place to relax . . . a comfortable place in the sky that means mobility to busy people.

"There are three new interior combinations: copper, turquoise or gold. Designed by comfort experts, more room has been engineered into the front and rear seats, removable arm rests and two magazine racks are extra utility features. Analysis by sound consultants has resulted in major advances in noise reduction which include quarter inch thick windshield and side windows. Additional fiberglas, sound-deadening material and more impervious wall-to-wall carpeting work together to provide quiet flying. . . . New double rear seat makes the 310B more luxurious than ever. Independent of each other and fully adjustable, this comfortable design is offered in all interior combinations."

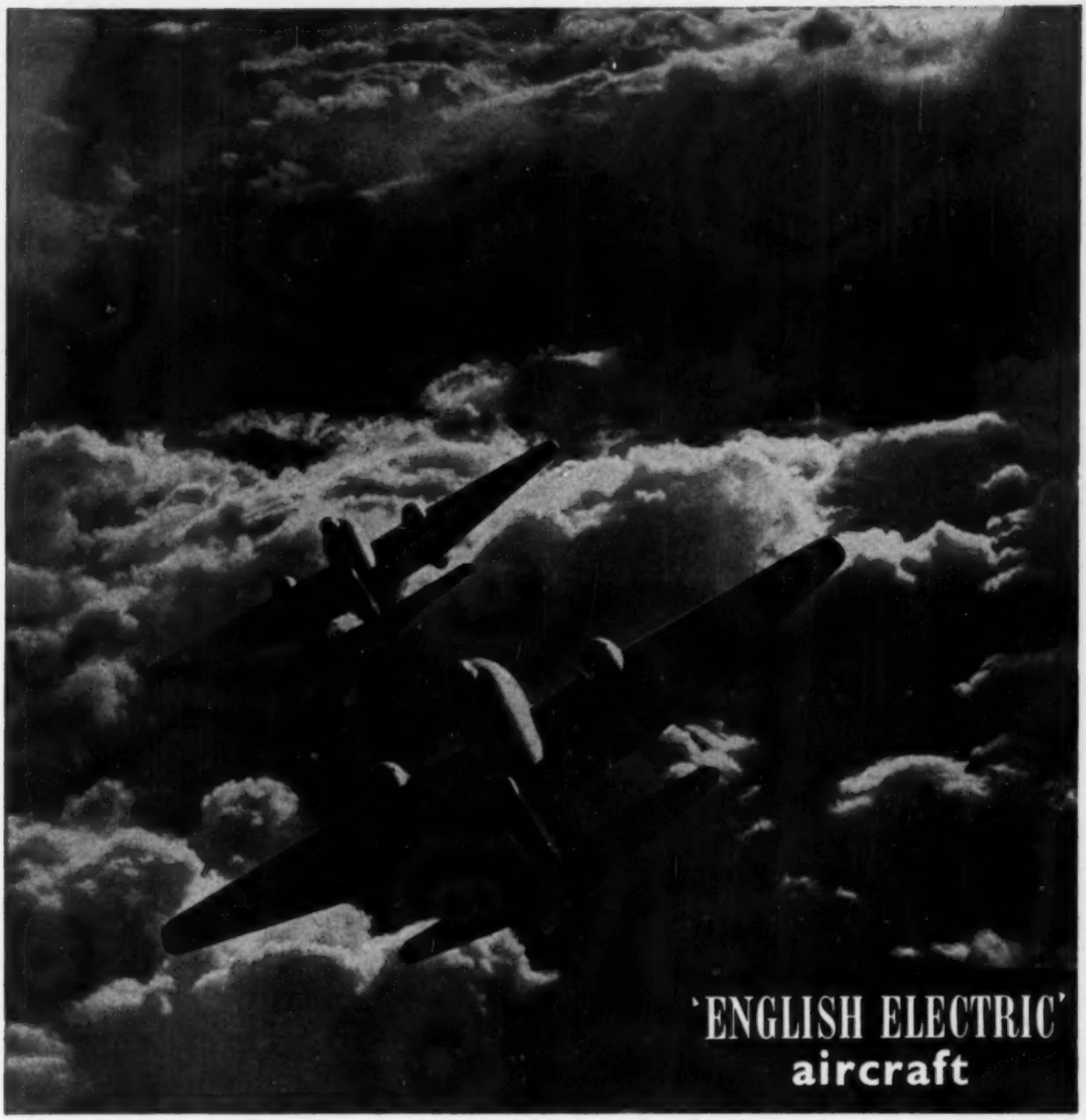
Exterior colour schemes are listed as cinnabar red, cornado yellow, sequoia brown and sea island blue.

210 This aircraft will be available for the commercial market in late 1959. Cessna announce that it will "give the company an entry in the high-performance single-engine market between the Skylane and the 310B." Secrecy is being maintained as to its characteristics, but a company official has said, "It's a mighty fast airplane."



Cessna 180.

Above, Cessna 182; below, Cessna Skylane.



THE CANBERRA — **Nine years ago the prototype ENGLISH ELECTRIC Canberra made its first flight. Here is the unique record of this outstanding aeroplane since that day:**

★The Canberra is in service in 8 Air Forces.

★The Canberra has been built in 3 Continents.

★More than 1,200 Canberra aircraft have been built so far—and production is still going on.

★9 years after the prototype's first flight, new Marks of the Canberra are still being developed.

★The Canberra is the only British aircraft to have been built under licence in America since 1918.

★Canberra aircraft hold 19 long-distance point-to-point world speed records.

★Canberra aircraft have broken the world's altitude record for aircraft three times.

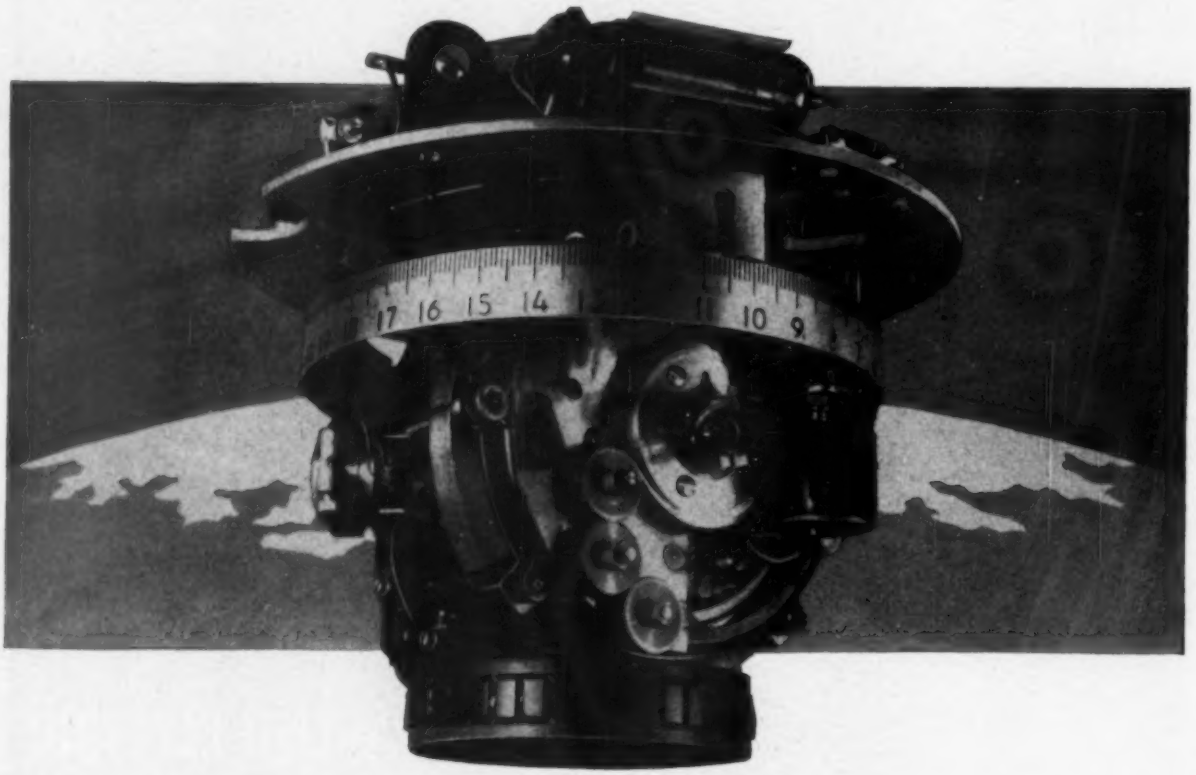
THE ENGLISH ELECTRIC COMPANY LIMITED, MARCONI HOUSE, STRAND, LONDON, WC2

A MEMBER OF THE ENGLISH ELECTRIC AVIATION GROUP

Now...a **non-floated** gyro that cuts random drift 90%

Sperry's Rotorace* Gyroscope technique

uses counter-rotating motor-driven gimbal bearings



THE REVELATION of an entirely new engineering technique, Sperry Rotorace, now makes possible extremely accurate, low-cost gyroscopes. Reduction of random drift rate to only 0.25 degree per hour already has been achieved in systems using these gyros. And in laboratory tests, drift rates as low as 0.05 degree per hour have been achieved.

Rotorace attains this unprecedented accuracy by means of a relatively simple, low-cost method : a small servo-motor rotates the outer races of two gyro gimbal bearings in opposite directions . . . then reverses the rotation periodically. Result is that friction is cancelled, errors due to minute irregularities in bearing construction are averaged out, and pitting and wearing of bearings is virtually eliminated.

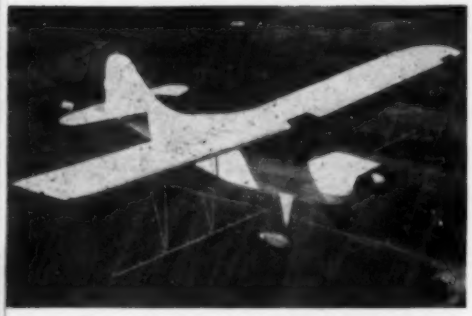
Rotorace gyros make possible Sperry Gyrosyn* compasses with greatly increased accuracy for ultra-precise navigation of civil and military high-performance aircraft. This improved accuracy is of particular importance for polar navigation or to provide the heading information where a Doppler navigation system is used.

**Trade Mark*

SPERRY *instruments and equipment*

SPERRY GYROSCOPE COMPANY LIMITED · GREAT WEST ROAD · BRENTFORD · MIDDLESEX · EALing 6771

Left, Cessna 310B.



Above, Champion Sky-Trac.

Below, Colonial C-2 Skimmer IV.

Business and Touring Aircraft . . .

Champion

DX'er The bearer of the foregoing designation is a three-seat, high-wing monoplane with a nosewheel undercarriage and powered by a Lycoming O-240-D2-B engine of 140 h.p. The makers take pride that for a selling price of $6,995 the DX'er offers 120 m.p.h. cruising speed and a 550-mile range at less than 4 cents per mile operating cost. Moreover, standard equipment includes complete electrical system, fully shielded ignition system, hydraulic brakes, parking brakes, all-metal propeller, built-in tie-down rings, foam rubber seat cushions, carpets, interior upholstery, door latch and key, soundproofing and landing lights. Dual controls are fitted and the front seat is adjustable.

Sky-Trac This aircraft resembles the DX'er but has a tailwheel undercarriage. The engine is the same—a Lycoming O-290-D2-B of 140 h.p., and standard equipment is identical with that listed for the DX'er. Custom equipment can include full IFR panel, complete radio equipment, spray equipment, twin floats, skis, tinted cabin enclosure, rotating beacon and special paint schemes and interiors. With the rear seat removed there is 31 cu ft of baggage space. As a sprayer the aircraft can be fitted with the Sorensen "Super Spray," available in either internal or external units with capacities of up to 90 gal.

Champion Aircraft, Osceola, Wisconsin.

Colonial

C-2 Skimmer IV Six Skimmers have been built and the makers report that 200 are on order. The type is a single-engined amphibian of attractive lines. A shoulder-wing monoplane, it is powered by a Lycoming O-360 engine delivering 180 h.p. to a Hartzell forged duralumin constant-speed propeller. The engine is mounted on a pylon vertically above the c.g. There are side-by-side seats in front, and a rear seat facing to starboard adjacent to the baggage compartment. Throttle and pitch levers are suspended from the roof, between the large, sloping, hinged windscreen panels. For docking the Skimmer is brought in bow-on, moored from the nose compartment and brought up so that the crew can walk out over the nose. The nosewheel-type undercarriage retracts hydraulically and the wings are fitted with slotted flaps extending over 80 per cent of the span. Standard equipment includes enamelled exterior, two-tone interior, door locks, stall-warning indicator, tow-bar, paddle and anchor.

Colonial Aircraft Corp., Sanford, Maine.

Fairchild

F-27 As America is the principal market for executive versions of the F-27 Friendship, designed by Fokker and built under licence in the U.S.A. by Fairchild, it is appropriate to consider this aircraft under the heading of the last-named company. The aircraft has an immediate appeal for executive operation. It is completely pressurized, has turboprop power (Rolls-Royce Darts), is fitted with weather radar and offers exceptionally good visibility because of its high-wing configuration and large window size (there are twenty large elliptical windows). The high wing eliminates wing glare from the sun. Fairchild discuss the executive F-27 in these terms: "To the executive, or corporate aircraft operator using multi-engine equipment, the Fairchild F-27 can solve several problems. One is the need for a pressurized transport that can equal or better the best twin-engine performance of the major air carriers. The F-27 on non-stop trips more than equals any point-to-point service the airlines can provide. Another problem in the executive field is how to meet the demand for a transport with excellent short-field capabilities, since a large percentage of executive aircraft flights are off airways and into non-terminal airports. Executive users also share the local service operators' problem of parts replacement and rising operating costs. This problem is compounded for the executive user, because his multi-engine aircraft include only a few post-war types and none in this class is pressurized. The executive fleet of multi-engine aircraft is a conglomeration, including converted B-26, B-24, B-25 and PV bombers, Lodestars, D-18s, Twin Beechcraft and DC-3s.

"The Fairchild F-27 offers the large corporate user an opportunity to standardize in the multi-engine field, and by so doing to reduce hourly operating costs and minimize maintenance and overhaul problems. At the same time, the F-27 will provide the range so important to the corporate user, particularly in the company whose fleet includes small twins for short-haul duty."

Fairchild Engine and Airplane Corp., Hagerstown, Maryland.

Fletcher

FU-24 Utility This low-wing cantilever monoplane has been produced primarily for agricultural work and has built-in provision for a hopper, spreader and other equipment necessary for dusting and fertilizing operations. A belt drive from the engine drives the spray pump. The cockpit is enclosed and is situated over the wing leading edge. Up to four passengers or cargo can be accommodated.

Fletcher Aviation Corp., Rosemead, California.

Forney

Aircoupe The Aircoupe has co-ordinated ailerons and rudders, eliminating the need for cockpit pedals. Standard equipment includes a rear luggage compartment (in which can be fitted a child's seat), a large rear accessory shelf, foam-rubber cushions and two-tone interior furnishing, V.H.F. transmitter and receiver, soundproofing, hot and cold air supplies and flush navigation lights.

Forney Manufacturing Co., Aviation Division, Fort Collins, Colorado.

Right, Forney Aircoupe.

Below, Fletcher FU-24 Utility.

Grumman Gulfstream.

Grumman Ag-Cat.

Business and Touring Aircraft . . .

Grumman

Gulfstream The background to the Gulfstream was discussed at length in *Flight* of November 8 last. A survey by Viemeister Associates, Inc., reported: "Replies favoured a low-wing design by a three-to-one ratio over the proponents of a high-wing design. Over 90 per cent of the writers wanted stand-up headroom; approximately the same percentage wanted weather radar. Nearly everyone demanded de-icing, a few people specifying thermal de-icing. Several people requested heated windshields. Only one person asked for JATO. About half the respondents wanted an autopilot. Ten people included a request for an approach coupler. A lesser number requested an integrated flight system. Several requested dual instruments and dual communications gear. Others asked for collision warning radar. Built-in loading stairs were also requested by a number of people. Other questions concerned desired gross weight and price." Several revisions were the outcome.

Aviation Week reports on the new aircraft as follows: "Fail-safe and safe-life structural design is aimed at providing a fatigue-free airframe life estimated at some 20,000 flight hours. Rugged design also borrows from Grumman's subsonic and supersonic fighter experience to provide a minimum of maintenance during the airplane's useful life. As an illustration, Gulfstream engineers point out that the integral wing fuel tank system, similar to that used on the company's F11F-1 Tiger supersonic carrier-based fighter, was designed from the start as a trouble-free item for the life of the airframe. Gulfstream's present 350 m.p.h.-plus design cruise speed with 2,105 e.s.h.p. Rolls-Royce Dart RDa.7/2 turboprops is capable of being boosted to well over 400 m.p.h. using future more powerful engines without requiring dimensional or structural modification. Today's basic airframe has a practical powerplant stretch capability to take engines up to approximately 3,200 e.s.h.p. when they become available."

Ag-Cat The Ag-Cat was designed to provide maximum wing area with minimum wing span (35ft 8in), a combination which permits making a continuous 1.5g turn at dusting speed and at maximum gross weight. A biplane, it has a wide variety of modern features and concepts incorporated in its design. Upper and lower wings are interchangeable; each is torsionally stiffened with a minimum of external wires, a factor which greatly reduces rigging time. The powerplant will be any one of the more than a half-dozen new or used engines available in the 200-300 h.p. class (dictated by detailed design analysis), with selection to be made by buyers.

Both the airspeed indicator and the r.p.m. indicator have been placed on a separate panel forward of the cockpit in the pilot's "flying line of vision," recognition having been given to the fact that in dusting or spraying operations pilots have little time to look inside the cockpit. Other features of the Ag-Cat include spring-steel undercarriage, rapid changeability from duster to sprayer, corrosion-proofed metal surfaces, interchangeability of all four ailerons, and a sloping nose for good visibility in normal flight attitude.

Production of the Ag-Cat is already under way. Two prototypes have been undergoing flight tests since early 1957 and more than 130 agricultural pilots have flown them.

Grumman Aircraft Engineering Corp., Bethpage, Long Island, New York.

Helio

Courier The Courier is powered by a Lycoming GO-435-C2B engine of 260 h.p., driving a constant-speed propeller. A four-seater, it is an all-metal high-wing monoplane with fixed undercarriage and combines relatively high performance and long range with stall-proof, slow-flight and ultra-short-field utility.

The constant-section, unbraced wing, of all-metal construction with fabric-covered ailerons, is provided with high-lift slotted flaps over 74 per cent of the span and with automatic slats over the entire leading edge. Unlike other slow-speed aircraft, the Courier has no fixed tailplane; instead it is provided with a variable-incidence "slab" tail with a span of 15ft. The cabin is entered by large doors, on the port side forward and to starboard at the rear. There are two pairs of seats which, with their mountings and surrounding structure, are stressed to recommendations of the Flight Safety Foundation. At the rear is a 200 lb baggage compartment; and, by removing the rear pair of seats, a compartment 6ft in length is made available, capable of taking a maximum load of 1,000 lb.

Equipment includes an oversize constant-speed propeller, Goodyear castering wheels, Griswold single-strap seat and chest belt and luggage compartment. Edo floats or Federal wheel-ski gear are offered.

Strato-Courier This model differs from the standard Courier in having a supercharged Lycoming GSO-480-A1A6 engine driving a three-blade Hartzell automatic constant-speed propeller (the standard Courier has a two-blade Hartzell). It has been developed particularly for high-altitude photography and can operate at comfortably over 30,000ft.

Helio Aircraft Corp., Norwood, Massachusetts.

Helio Courier.

Hiller 12E.

Hiller

12E The 12E helicopter is entering production this month and is considered as a purely commercial aircraft for business, industry and agriculture. Its 12C predecessor, as used in many countries, has been phased out of production.

The 12E is claimed to be the most powerful helicopter in the 2/4-seat class; its engine is the Lycoming VO-540 of 305 h.p. Compared with the 12C, the 12E will transport 65 per cent more payload, 50 miles farther, and hover in ground effect four times higher. The Hiller "Rotormatic" control system has now been fitted with fairings for more efficient control and improved lift. The tail rotor system is completely new and a cabin heating system is installed.

Hiller Aircraft Corp., Palo Alto, California.

Howard Aero

Super Ventura The Super Ventura is a rebuilt Lockheed PV-1. It cruises at speeds of over 300 m.p.h. for over 2,000 miles with a crew of two, 14 passengers and 1,500 lb of baggage. Reserve fuel, when used in a holding pattern, is good for 1 hr 24 min. Using higher cruise-power settings the aircraft can be cruised at over 330 m.p.h. with an average load, and with economy cruise-power the range can be increased to over 3,000 miles. The engines are Pratt and Whitney R-2800-CB16-17s of 2,500 h.p. each. The entire fuel load—1,350 U.S. gal—is contained in the wings. Spring-tab controls have been introduced and the makers claim that the flight characteristics have been so improved to meet modern standards, and are so vastly different from those of the original aircraft, that it is hard to believe that they are of the same origin.

Howard Aero Inc., Manufacturing Division, International Airport, San Antonio, Texas.

Howard Aero Super Ventura.

Larson D-1.

Mooney Mark 20-A.

Larson

D-1 Powered with a Lycoming R-680 engine of 225 h.p. or a 220 h.p. R-670, the D-1 is an easily maintained aircraft—with a very low capital cost—for general-purpose spraying duties. Among the novel features are: use of car wheels, tyres and brakes; uncovered rear fuselage; power package removed from war-surplus Stearmans; twin rudders which also serve as fins; cockpit placed behind the load; four ailerons all mounted at mid span; and a tailwheel unit comprising a standard industrial 14in tyre mounted on parallel leaf-springs.

Larson Aero Development, Buchanan Field, Concord, California.

Lockheed

Jetstar The Jetstar is the first aircraft to be designed to meet the UCX specification issued by the U.S. Air Force for a combat-readiness crew trainer and transport. As such it has obvious potential as a commercial or business machine and is to be marketed as such. Cruising speed is about 500 m.p.h.

The fuselage is pressurized to 8,000ft equivalent at 45,000ft and has an interior width from 75 to 79in, an aisle headroom of 74in and a usable length of 28ft behind the flight deck. As a passenger transport many furnishing layouts are available, but the standard interior provides for a crew of two, ten passengers and full pantry and toilet facilities.

Standard equipment in the very attractive flight deck includes an MA-1 Flight Director system, provision for weather radar, autopilot controls and the following radio equipment: ARN-31 glide slope and I.L.S., ARN-14 Omni, ARN-6 A.D.F., ARA-26 keyer, ARC-10 intercom., ARC-12 V.H.F. and ARC-34 U.H.F.

The propulsion system, which is mounted on the flanks of the rear fuselage, comprises either two Bristol Orpheus or four General Electric J85s. Fuel is contained in integral tanks extending from the wing-root rib to the tip, the system being filled at 167 Imp. gal/min through a pressure connection in each wing. Jettison pipes are provided at the wing tips. Total capacity is 1,365 Imp. gal, and this can be supplemented by a pair of 250 Imp. gal underwing slipper tanks arranged like those of the Comet 4. A photograph appears on page 590.

Lockheed Aircraft Corporation, Burbank, California.

Mooney

Mark 20 This four-seater low-wing monoplane is powered with a Lycoming O-320 engine of 150 h.p. driving a Hartzell constant-speed propeller. The soundproofed cabin has individual seats at the front and a bench at the rear, and is fitted with a heater and all the furnishings generally installed in American executive aircraft of this class (e.g., ashtrays, heating, foam-rubber cushions, coathangers and curtains). The airframe is manufactured from pressure-bonded laminated spruce, and the wings have three-position manually operated slotted flaps.

Mark 20-A Powered with a Lycoming O-360-A1A engine of 180 h.p. this developed Mark 20 is enthusiastically reported upon by the editor of the American publication *Flight Magazine*. He writes: "How would you like to cruise well up in the 170-mile-an-hour speed spectrum behind 180 horsepower on only 8.4 gallons of gasolene per hour? That's getting 20 miles per gallon with high performance. We did just that on a recent flight from Mooney Aircraft's factory at Kerrville, Texas, to our home base in the brand-spanking-new 180 h.p. Mark 20-A—it features a thirty horsepower increase over the Mark 20. . . . Just as impressive as the improved performance from additional horsepower is the amazing comfort achieved in the 1958 model. Even the severest critics of Mooney's space-saving-for-performance philosophy probably now will admit there's plenty of room in front and back seats, accomplished by some real smart cabin design and upholstering, offering plus comfort without compromising performance. They've turned in a remarkable job of soundproofing, too, and much credit for the quiet cabin must go to the finely engineered watertight door."

Mark 22 The prototype of this new light twin has recently been completed. The engines are Lycoming O-360s of 180 h.p., and this trim little aircraft—a four-seater—is expected to cruise at 210 m.p.h. on 70 per cent power. Price should not exceed $30,000. Ranges of up to 1,200 miles should be possible.

Mooney Aircraft, Inc., Kerrville, Texas.

National

NA-76 This agricultural aircraft is based on the war-time Stearman training biplane. The fuselage has been largely redesigned and is covered with ten metal panels secured by patented quick-release fasteners all of which can be undone in five minutes by two men with screwdrivers, to lay the whole structure bare from the firewall to the tail. In the centre is the 31.7 cu ft glass-fibre dusting/spraying hopper (both types of chemical can be loaded together and the change made from one to the other in flight). Behind the hopper is the single cockpit, and for better visibility the NA-75 is designed to fly nose down at all times, all instrumentation being installed in the trailing edge of the upper-wing centre section.

National Aircraft Corporation, Burbank, California.

North American

Sabreliner The Sabreliner meets the U.S.A.F. UTX utility trainer/transport specification, and is the first new aircraft to fly with the G.E. J85 lightweight turbojet, two of which are installed in lateral fuselage-mounted "pods" between the wing and tailplane. Although capable of carrying up to ten persons, the Sabreliner is smaller than the F-100 Super Sabre and weighs only 15,330 lb. A North American spokesman has said: "The airplane was designed and manufactured at company expense to meet a specific Air Force requirement. It should be of special interest to taxpayers because the Government actually can save millions of dollars a year by replacing older, obsolete aircraft which have tremendous maintenance and operating costs. The Sabreliner can be operated for one-third the cost of such current aircraft as the B-25 . . ."

Leading-edge slats are fitted to the back-swept wings. The basic cabin arrangement is for four passengers and a crew of two, although, as already stated, the aircraft is capable of carrying up to ten people in all. Speeds of up to 575 m.p.h. are attainable, and the cabin is pressurized to 8,000ft.

North American Aviation Inc., International Airport, Los Angeles, 45, California.

Northern

Bellanca Cruisemaster The Cruisemaster combines excellent field performance with relatively high speed (196 m.p.h. cruising on 75 per cent power). A four-seater, it is powered with a Continental O-470-K engine of 230 h.p. driving a Hartzell constant-speed propeller. Fuselage construction is of tubular steel and the wing is a wooden two-spar structure. There is a compartment behind the cabin for 186 lb of luggage, and cabin heating is standard.

Northern Aircraft Inc., Alexandria, Minnesota.

Oakland Airmotive

PV-2 Centaurus This is a conversion of the Lockheed PV-2 Harpoon having a cruising speed of 180 m.p.h. and a range of over 2,000 miles. Pressurization is optional, and price is in the order of $450,000. The engines are Pratt and Whitney R-2800s and the wing-tips are squared off. From eight to fourteen passengers can be seated.

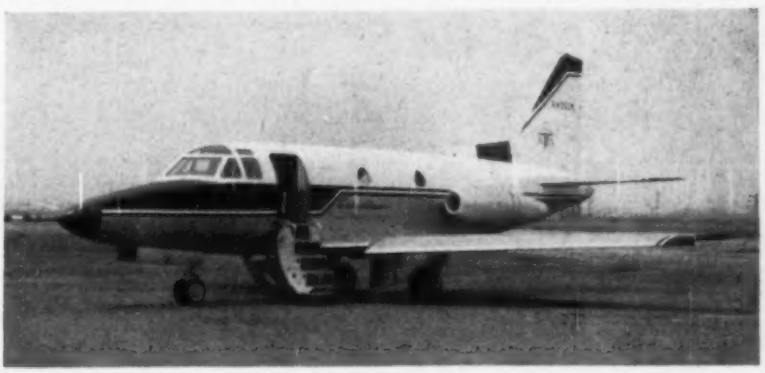
Super V A converted Beechcraft Bonanza, this aircraft has two fuel-injected Lycoming O-340 engines and will sell for $27,500. Conversions from existing Bonanzas can be undertaken for about $15,000.

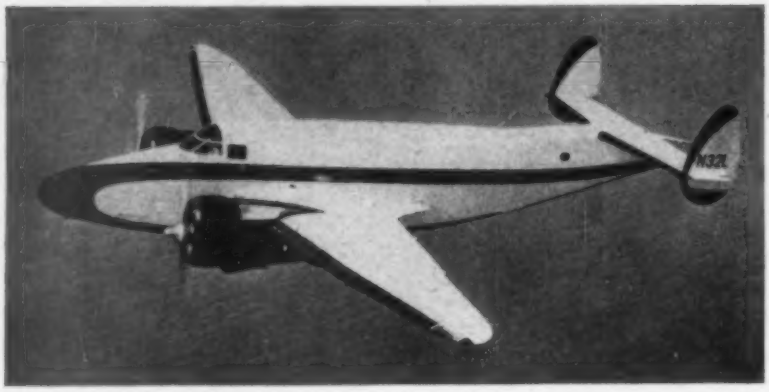
Oakland Airmotive Co., Oakland, California.

Above, National NA-75.

Right, North American Sabreliner.

Below, Oakland Airmotive Super V.





Above, On Mark Marketeer; below, PacAero Learstar Mk II.

Business and Touring Aircraft . . .

On Mark

Marketeer This handsome aeroplane is a conversion of the Douglas B-26 light bomber, and it is claimed to equal or better the fastest airline schedules and to be capable of crossing the U.S. non-stop. A cruising speed of over 200 m.p.h. is possible on one of the two Pratt and Whitney R-2800 engines. The makers state: "After the airplane has been stripped of its armament, it is entirely re-engineered, re-framed and altered . . . all surface metal of fuselage, wing and empennage structures is inspected . . . The aft wing-spar that passes through the fuselage is removed and is replaced by a ring of steel . . . Most of the skin metal is removed, stringers and ribs are altered, added to and strengthened. Large 'picture windows' are installed, as is the side entrance. Thick Fiberglas insulation is packed in cabin and cockpit walls . . . When changes in the structure are completed, the interior is finished off to customer's specification that includes a lavatory and a seating capacity for up to seven passengers in clubroom comfort . . ."

On Mark Engineering Co., 7929 Hayvenhurst Avenue, Van Nuys, California.

PacAero

Learstar Mk I Twenty-eight of this type of Learstar have been sold since February 1955. It differs from the Mk II in having Wright R-1820-76A, -76B, or -86 engines.

Learstar Mk II The engines of this second mark are Wright R-1820-56As, -66s, or -72As. The makers describe the conversion from the Lodestar in these terms: "Your non-stop cruising range is increased to more than 2,500 miles (at 270 m.p.h.). You will gain vastly improved stall characteristics and greater stability in flight . . . The outstanding features of the Learstar Mk II are produced by remanufacture of outer wing structure including extra fuel capacity of 480 U.S. gal. New cowling and engine mounts designed to fit any 1820 engine are installed. New wheels, brakes, wheel well doors and mechanisms, fire detection and extinguisher systems and electrical, fuel, hydraulic and mechanical systems are fitted."

PacAero Engineering Corp., 3021 Airport Avenue, Santa Monica, California.

Piper

Apache Fifteen hundred Apaches have been built since this attractive little four-seater was introduced in 1954. The engines are Lycoming O-320-Bs of 160 h.p. The standard layout is for four separate deeply upholstered seats, each individually movable fore and aft and with adjustable backs. A fifth can be slid on to tracks at the rear of the cabin, and it is possible to carry a full fuel load (including auxiliary tanks) and five 175 lb passengers. The interior styling comes in three colour combinations—"Bahama blue, Santa Fe red, or Herschey brown." Cabin air conditioning is standard.

Comanche The standard Comanche has the Lycoming O-360 engine of 180 h.p. A four-seater, it has two separate individually adjustable front seats and a single rear bench. The luggage compartment accommodates 22 cu ft of baggage.

Comanche 250 Installation of a Lycoming O-540-A1A engine of 250 h.p. raises the cruising speed (75 per cent power) to 181 m.p.h. Of this new model and of the standard Comanche 500 have been built since the type was introduced early this year.

Tri-Pacer Seven thousand of these little aircraft have been built since the type was introduced in 1951. The engine is a Lycoming O-320-B of 160 h.p. and the aircraft is normally a four-seater. The 1959 model is available in standard, "super custom" and "AutoFlite" forms. The last-named has an electric autopilot designed by Piper, weighing 4½ lb.

Super Cub A world-famous aircraft that continues in production with Continental 90 h.p. or Lycoming 150 h.p. engine.

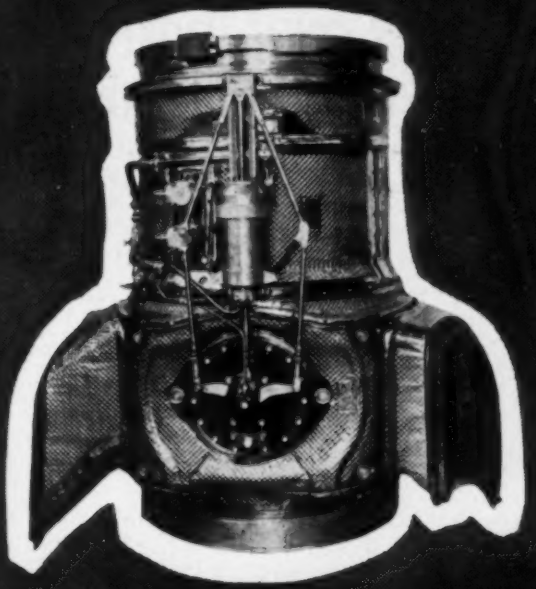
PA-18-A This agricultural version of the Super Cub is operating in more than forty different countries.

Piper Aircraft Corp., Lock Haven, Pennsylvania.

Upper left, Piper Comanche.

Left, Piper Apache.

Below, Piper Tri-Pacer.



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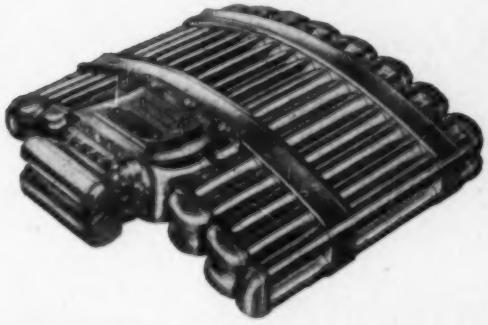
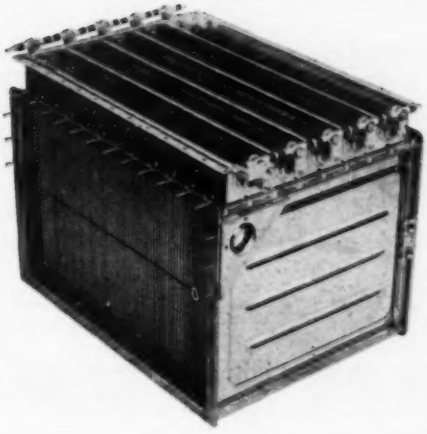
High pressure fuel-cooled oil coolers for high performance gas turbine engines. This unit is used in the Armstrong Siddeley Sapphire S.A.7.





Heat exchangers for many purposes in both aluminium alloy and stainless steel. This particular example is for the Vickers Vanguard's anti-icing system. Similar units are being supplied for the Fokker Friendship, the Bristol Britannia, the Armstrong Whitworth Argosy, the Vickers Viscount and the Handley Page Herald.

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HERE is the only aircraft in the world that can transport bulk-size weapon systems without disassembly over long-range route supply systems.

Now operational for the United States Air Force over intercontinental routes, the C-133 has the capacity to swallow an ICBM whole or transport 200 fully equipped troops. It is the most efficient turbine-powered cargo airplane *at all* ranges, from the shortest to the longest.

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Sikorsky S-62.

Sikorsky

S-62 The first amphibious helicopter ever built with a flying-boat-type hull that will permit landings on and take-offs from land, water, ice, snow or swamp, the S-62 has numerous attractive features for executive operation. It is gas turbine-powered—with a General Electric T58 or Lycoming T53; it can hover out of ground effect at 8,000ft at full gross weight; and it can carry from ten to twelve people. Provision is made for automatic stabilization and all-weather instrumentation. A pure land version is offered and this will be slightly faster and carry 300 lb more payload than the amphibian.

Taylorcraft

Zephyr 400 The wings, fuselage, cowling, doors, seats, fuel tanks and other parts of the Zephyr 400 are made of moulded glass fibre and a bridge-type frame of welded steel tubing, together with the glass-fibre structure, is said to form a structure of unequalled safety. Not only the ailerons and flaps are slotted but the wing-tips also. The Continental O-470-J engine of 225 h.p. has a particularly neat form of two-piece cowling.

Seabird The Seabird is the floatplane version of the Zephyr 400. The floats are made by Edo.

Topper The third of the glass-fibre Taylorcrafts, the Topper is an agricultural aircraft for spraying and dusting. The makers remark that fabric-covered wings are subject to the rotting and burning action of strong spraying or dusting mixtures, while metal-covered wings suffer from corrosion and pitting. Glass fibre, they say, is not affected by such materials.

Taylorcraft, Inc., Conway, Pennsylvania.

Above, Taylorcraft Seabird.

Below, Taylorcraft Topper.

Below, Taylorcraft Zephyr 400.

Transland

Ag-2 This is a "farm and forest" aircraft. An all-metal, low-wing monoplane, it is powered with a Pratt and Whitney R-1340 engine of 600 h.p., and although originally designed as an open cockpit aircraft, it is now offered with a sliding canopy. A jump seat for one person is provided aft of the pilot, and by utilizing additional seats located in the hopper the aircraft can carry up to four people.

The Ag-2 has a complete and separate system for dispensing solids and another for liquids. Both systems can be controlled singly or simultaneously by the pilot. The 53 cu ft hopper will hold 2,000 lb of low-density solids and up to 3,000 lb of higher specific gravity materials or fire retardant chemicals and is an integral part of the fuselage—located between the engine firewall and the cockpit. Four separate spray tanks are located two in each inner wing and the two fuel cells are located one in each outer wing.

Transland Aircraft, Torrance Municipal Airport, Torrance, California.

Trecker

Gull The Trecker Aircraft Corporation imports from Piaggio (Italy) complete P.136 airframes, fits them with powerplants and installs various types of interior furnishings to order. The engines can be supercharged Lycoming GSO-480-A1A6s each delivering 340 h.p. for take-off, or unsupercharged units of the same family. Seventy-five Gulls have been built or ordered.

Trecker Aircraft Corp., General Mitchell Field, Milwaukee 7, Wisconsin.

Vertol

44C Executive This twin-rotor helicopter cruises at 100 m.p.h. and has a maximum range of 300 miles. The company report: "The interior is decorated in tones of tan, with gold accents. The divan and two armchairs are upholstered in a nubbly material of rosy beige, the other seats in soft tan leather. Each seat is adjustable for comfort and can be swivelled through a 360 deg arc. The cabinet work is in limed walnut, set off with deep-pile beige carpeting. Purchasers can use the Vertol interior or design their own."

107 Developments of this twin-turbine helicopter are expected to be ready for the airline market in 1961 and executive versions should prove extremely attractive. The aircraft is capable of speeds of up to 160 m.p.h. and can seat up to 23-25 passengers.

Vertol Aircraft Corporation, Morton, Pennsylvania.

Below, Transland Ag-2.

Right, Vertol 107.

Business and Touring Aircraft 1958

WHAT THE WORLD'S MANUFACTURERS HAVE TO OFFER

Country, maker and type	Span (Note 1) ft in	Length ft in	Powerplant No.	Powerplant Type	Powerplant Total T.O. power (Note 2)	Normal gross weight lb	Disposable load lb	Seats	Performance Max. cruising speed m.p.h.	Performance Stalling speed m.p.h.	Performance Max. still-air range st. miles	Performance Initial rate of climb ft/min	Performance Take-off distance ft	Performance Single-engine ceiling ft	Price (Note 3) £
Great Britain															
Auster Aircraft:															
Alpha	36 0	23 2	1	Lyc. O-290-3	130	2,000	822	3	98	31	400	665	300	13,300	1,865
Alpha	36 0	23 2	1	D.H. Gipsy Major	130	2,000	828	3	103	32	410	710	405	14,200	2,350
Alpine	36 0	23 2	1	D.H. Gipsy Major	145	2,250	900	3	112	34	455	710	420	14,600	3,775
Aiglet Trainer	32 0	23 2	1	D.H. Gipsy Major	145	2,200	925	2/3	117	41	450	625	750	13,300	3,600
Autocar	36 0	23 2	1	D.H. Gipsy Major	145	2,450	1,124	4	111	36	425	620	585	13,600	3,700
Auster Sprayer	36 0	23 2	1	D.H. Gipsy Major	130	2,350	647	2	93	32	170	620	562	13,400	3,095
Workmaster	36 0	23 5	1	Lyc. O-360-A	180	2,650	1,075	2	99	36	350	580	786	10,500	—
Agricola	42 0	28 0½	1	Cont. O-470-M2	240	3,675	1,800	1/3	123	51	218	530	825	12,000	—
Aviation Traders:															
Prentice Conversion	46 0	31 6½	1	D.H. Gipsy Queen	250	4,350	1,100	4/5	126	63	700	450	1,200†	14,000	1,825
Bristol:															
Sycamore (H)	48 7	61 4	1	Alvis Leonides	520	5,600	1,635	8	115	—	273	1,220	—	14,600	44,500
de Havilland:															
Dove 6	57 0	39 3	2	D.H. Gipsy Queen	760	8,800	2,920	13	202	74	880	920	2,430†	—	—
Heron 2	71 6	48 6	4	D.H. Gipsy Queen	1,000	13,500	4,686	17	191	75	1,560	1,075	2,424†	10,650*	—
Chipmunk Mk 23	34 4	25 5	1	D.H. Gipsy Major	145	2,420	800	1	86	44	—	500	600†	—	—
Edgar Percival:															
E.P.9 (normal)	43 6	29 6	1	Lyc. GO-480-B	270	3,700	1,690	6	142	35	580	1,120	315	17,500	9,360
(agricultural)	43 6	29 6	1	Lyc. GO-480-B	270	4,140	2,130	1/3	140	35	—	800	525	—	9,775
Garland Bianchi:															
Linnet 1	26 7	18 6	1	Cont. C90F-14	90	1,400	558	2	120	34	600	700	1,650†	—	2,000
Hunting:															
President	64 6	46 0	2	Alvis Leonides 514	1,120	13,500	4,068	14	215	77	1,036	1,070	2,520†	8,750	—
Jackaroo Aircraft:															
Jackaroo Mk 2	30 4½	25 5	1	D.H. Gipsy Major	130	2,180	550	4	85	45	280	500	—	8,500	1,270
Saunders-Roe:															
S31 (H)	32 6	29 0	1	Blackburn Turmo	425	4,000	1,650	5	115	—	240	1,200	—	12,500	under 30,000
Vickers-Armstrongs:															
Executive Viscount	93 8½	81 10	4	R-R. Dart RDa.7	7,560	64,500	24,060	40/48	365	100	2,900	1,500	5,250†	—	435,000
Westland:															
Widgeon (H)	49 2	41 2½	1	Alvis Leonides	515	5,900	1,477	5	101	—	299	1,092	—	12,000	—
Whirlwind (H)	53 0	42 0	1	Alvis Leonides Major	750	7,800	2,364	—	99	—	333	880	—	16,500	—
Australia															
Commonwealth:															
Ceres	46 11	30 8½	1	P. & W. Wasp	600	6,640	—	1	100	54	—	—	—	—	11,200
Kingsford Smith:															
Cropmaster	38 0	29 6	1	Warner Scarab	170	3,000	1,315	1	97	50	350	520	585	—	—
Canada															
D.H. (Canada):															
Beaver	48 0	34 4	1	P. & W. Wasp	450	5,100	1,994	7	135	45	450	1,020	560	18,000	—
United States															
Aero:															
500	49 6	35 1½	2	Lyc. O-540	500	6,000	2,150	7	205	63	1,100	1,400	1,400†	8,150	23,100
560-E	49 0	35 0½	2	Lyc. GO-480-C	590	6,500	2,200	7	210	66	1,715	1,450	1,452†	8,000	31,900
680 Super	44 0	35 5	2	Lyc. GSO-480-B	680	7,000	2,670	7	230	71	1,600	1,600	1,575	15,000	26,600
680-E	49 6	35 1½	2	Lyc. GSO-480-B	680	7,500	3,025	6	226	71	1,400	1,525	1,570†	14,300	33,600
720 Alti-Cruiser	44 0	35 5	2	Lyc. GSO-480-B	680	7,000	1,800	6	230	70	1,450	1,625	1,500‡	—	65,000
Beechcraft:															
Super 18	49 8	35 2½	2	P. & W. R-985	900	9,300	3,250	10	215	78	1,626	1,350	1,800†	9,800	42,100
Twin Bonanza D50A	45 3	31 6½	2	Lyc. GO-480-G	590	6,300	2,210	6	203	71	1,230	1,450	905	7,000	27,500
Twin Bonanza F50	45 3	31 6½	2	Lyc. GSO-480-B	680	7,000	2,540	6	228	79	1,310	1,600	940	12,550	31,300
Travel Air 95	37 10	25 4	2	Lyc. O-360-A	360	4,000	1,420	4	200	70	1,100	1,360	850	6,200	17,650
Bonanza J35	32 10	25 2	1	Cont. O-470-C	250	2,900	1,080	4	200	57	1,060	1,250	670	21,300	8,650
Bell:															
47J Ranger (H)	37 2	43 4	1	Lyc. VO-435	240	2,800	1,185	4	105	—	212	930	—	19,700	24,400
47G-2 Trooper (H)	35 0	41 4½	1	Lyc. VO-435	200	2,450	886	3	100	—	253	910	—	16,800	15,900
Cessna:															
150	33 4	21 0	1	Cont. C-200-A	100	1,500	538	2	124	50	630	740	1,205†	15,300	2,480
172	36 2	25 0	1	Cont. O-300-A	145	2,200	945	4	124	52	620	660	1,650†	13,300	3,200
175	36 2	25 0	1	Cont. GO-300-A	175	2,350	1,038	4	139	53	720	850	1,340†	15,900	3,930
180	36 2	25 6	1	Cont. O-470-K	230	2,650	1,095	4	160	56	845	1,130	1,080†	21,500	4,970
182	36 2	25 2	1	Cont. O-470-L	230	2,650	1,090	4	155	56	805	1,030	1,080†	19,800	5,110
Skylane	36 2	25 4	1	Cont. O-470-L	230	2,650	1,090	4	158	56	819	1,030	1,310†	19,800	6,050
310B	35 9	27 5	2	Cont. O-470-M	480	4,700	1,735	5	213	74	975	1,660	1,410†	7,750	21,300
Champion:															
DX'er	33 5	22 1	1	Lyc. O-290-D	140	1,650	719	3	120	42	638	1,040	280	18,100	2,490
Sky-Trac	33 5	22 1	1	Lyc. O-290-D	140	1,650	719	3	120	42	638	1,040	280	18,100	2,330
Colonial:															
C-2 Skimmer IV	34 2	23 6	1	Lyc. O-360	180	2,350	825	4	136	52	500	800	—	—	7,750
Fairchild:															
F-27	95 2	77 1½	2	R-R. Dart 527	3,980	35,700	11,700	36/44	276	78	1,700	1,400	2,450†	14,000	248,000
Fletcher:															
FU-24 Utility	42 0	31 10	1	Cont. O-470-E	225	3,500	1,630	1	111	42	370	625	870†	15,700	—
Forney:															
Aircoupe F-1	30 0	20 2	1	Cont. C-90	95	1,400	510	2	130	56	500	800	1,100	18,000	2,490

Country, maker and type	Span (Note 1) ft in	Length ft in	Powerplant No.	Powerplant Type	Powerplant Total T.O. power (Note 2)	Normal gross weight lb	Disposable load lb	Seats	Performance Max. cruising speed m.p.h.	Performance Stalling speed m.p.h.	Performance Max. still-air range st. miles	Performance Initial rate of climb ft/min	Performance Take-off distance ft	Performance Single-engine ceiling ft	Price (Note 3) £
Grumman:															
Gulfstream	78 6	64 0	2	R-R. Dart RDa.7	4,210	31,000	11,080	21	370	—	2,200	—	2,115	17,000	250,000
Ag-Cat	35 8	24 4	1	Cont. R760	220	3,600	1,421	1	—	40	303	—	—	—	6,430
Helio:															
Courier	39 0	30 0	1	Lyc. GO-435	260	3,000	1,035	5	180	30	700	1,124	542†	22,700	10,560
Hiller:															
12E (H)	35 5	27 10	1	Lyc. VO-540-A	305	2,700	1,000	3	87	—	185	1,300	—	16,200	21,300
Lockheed:															
Jetstar	58 9½	53 8½	2	Wright TJ-37	9,700	38,300	22,700	22	505	—	2,600	6,600	3,420‡	—	—
Mooney:															
Mark 20-A	35 0	23 0	1	Lyc. O-360	180	2,450	1,000	4	181	57	1,080	1,150	610	22,000	5,900
Mark 22	35 0	23 0	2	Lyc. O-360	360	3,250	1,300	4	220	—	1,400	1,500	—	—	11,000
National:															
NA-75	33 0	24 9	1	P. & W. R-985	450	4,612	2,000	1	—	35	—	550	785	—	—
North American:															
Sabreliner	42 6	43 9	2	G.E. J85	4,000	15,330	7,180	8	500	—	1,380	—	—	—	—
Northern:															
Bellanca Cruisemaster	34 2	22 10½	1	Cont. O-470-K	230	2,700	1,010	4	196	48	800	1,510	650†	22,500	6,410
PacAero:															
Learstar Mk 2	65 6	56 6	2	Wright R1820	2,700	22,500	8,700	12	294	89	2,500	1,505	2,300†	13,200	67,900
Piper:															
Apache 160	37 0	27 1	2	Lyc. O-320-B	320	3,800	1,570	5	171	61	1,260	1,260	1,190	5,500	—
Comanche 250	36 0	24 8½	1	Lyc. O-540-A	250	2,900	1,200	4	181	64	1,100	1,400	750	22,000	—
Comanche 180	36 0	24 8	1	Lyc. O-360-A	180	2,550	1,075	4	160	58	1,100	910	750	21,000	—
Tri-pacer 160	29 4	20 6	1	Lyc. O-320-B	160	2,000	890	4	134	49	655	800	—	19,000	—
Super Cub PA-18	35 4	22 6	1	Lyc. O-320	150	1,750	820	2	115	43	460	960	200	21,300	—
Sikorsky:															
S-62 (H)	53 0	44 7	1	G.E. T58	1,050	7,500	2,950	10	98	—	230	1,160	—	15,700	—
Taylorcraft:															
Zephyr 400	34 8	24 4	1	Cont. O-470-J	225	2,750	1,750	4	150	50	750	900	—	15,000	4,980
Seabird 400	34 8	24 4	1	Cont. O-470-J	225	3,040	2,010	4	130	50	650	700	—	14,000	4,990
Topper	34 8	24 4	1	Cont. O-470-J	225	3,767	1,990	1	110	50	380	690	—	15,000	4,780
Transland:															
Ag-2	42 0	28 5	1	P. and W. R-1340	600	6,000	2,600	1	120	61	—	950	450	—	10,200
Trecker:															
Gull P.136-L2	44 5	35 6	2	Lyc. GSO-480-A	680	6,614	1,930	5	180	72	994	1,279	1,440†	10,300	31,900
Vertol:															
107 (H)	48 4	44 3	2	G.E. T58-GE-6	2,050	15,550	6,450	23	—	—	—	—	—	—	—
Czechoslovakia															
Super Aero	40 5	24 9	2	Walter Minor	210	3,527	1,408	4	145	62	993	755	723	4,420	—
Meta Sokol	32 9	24 10	1	Walter Minor	105	1,145	880	3/4	130	55	530	540	830	14,000	—
L-60	45 9	28 0	1	Praga Doris	220	3,410	1,212	4	109	32	448	765	295	14,750	—
HC-2 Helibaby (H)	28 11	34 5	1	Praga DH	83	1,280	440	—	62	—	93	710	—	10,150	—
France															
Max Holste:															
Super Broussard	70 1	51 10	2	P. & W. R-1340	1,200	14,603	5,753	22	—	—	—	—	—	—	—
Morane Saulnier:															
Paris	33 4	33 0	2	Turb. Marboré 2	1,760	7,600	3,340	4	400	99	825	2,166	4,460†	8,200	—
S.A. Normande:															
D.117 G'd Tourisme	27 0	—	1	Cont. C-90	90	1,290	562	2	122	31	725	786	394	16,400	2,900
D.140 Mousquetaire	33 6	25 10	1	Lyc. O-360	180	2,400	1,220	4/5	144	41	812	—	690	—	4,340
S.C.A. Nor:															
C.P. 301A Emeraude	26 0	20 9	1	Cont. C-90	90	1,445	629	2	115	40	620	—	450	—	2,000
Sud:															
Djinn (H)	36 0	17 5	1	Turb. Palouste	190	1,676	882	2	62	—	124	780	—	7,546	—
Alouette 2 (H)	33 6	31 10	1	Turb. Artouste	400	3,300	1,426	5	105	—	373	990	—	—	26,800
Germany															
Blume:															
Bl-502	34 5	26 4	1	Lyc. O-320-A	150	2,460	990	4	137	56	560	980	1,220†	—	5,400
Dornier:															
Do 27	39 4	31 4	1	Lyc. GO-480-B	270	3,308	1,135	4	128	35	540	1,260	288	18,045	—
Klemm:															
Kl 107B	36 10	26 7	1	Lycoming	150	2,072	816	3	133	44	466	885	—	17,550	3,270
Italy															
Aviamilano:															
F.14 Nibbio	31 2	23 7	1	Lyc. O-360	180	2,550	1,050	4	192	55	800	1,200	590	17,700	—
Nardi:															
FN-333	34 0½	23 11	1	Cont. O-470-H	240	2,976	948	4	166	63	683	1,279	1,490	18,000	8,950
Piaggio:															
P.149-D	36 6	29 0½	1	Lyc. GO-480-B	270	3,704	1,147	5	165	60	680	1,127	1,328†	16,400	—
P.166	46 9	38 0½	2	Lyc. GSO-480-B	680	7,716	2,712	8	207	68	1,528	1,305	1,550†	13,500	—
Netherlands															
N.H.I.:															
Kolibrie (H)	33 0	13 10½	2	N.H.I. TJ-5	60	1,434	904	2	62	—	60	800	—	—	8,090

Note 1: Wing span or rotor diameter. **Note 2:** Figure refers to h.p., e.h.p., or lb thrust as appropriate for type of engine (e.g., Kolibrie, e.h.p.; Djinn, gas h.p.)
Note 3: Prices quoted for basic aircraft ex-works, and should not be taken as final.
*Three-engined in case of four-engined aircraft. †Take-off distance to 50ft. ‡Balanced field length. (H) Helicopter.
Engines: R-R., Rolls-Royce; D.H., de Havilland; Turb., Turboméca; Lyc., Lycoming; Cont., Continental; P. and W., Pratt and Whitney; G.E., General Electric.

CIVIL AVIATION

October 4, 1958: At London Airport B.O.A.C. Comet 4 G-APDC takes aboard passengers for the world's first transatlantic jet service. From New York on the same day Comet 4 G-APDB operated the first eastbound service in a record time of 6 hr 12 min.

DIARY OF A FAST-MOVING WEEK

SINCE last week's *Flight* went to press, Comet 4 affairs have moved fast. Indeed, in the space of six days—between September 29 and October 4—the following events took place: (1) The aircraft was awarded its Certificate of Airworthiness; (2) de Havilland handed over two aircraft to B.O.A.C. (see photograph on page 538 last week, and the pictures below); (3) the third and fourth Comets were delivered to B.O.A.C.; (4) Noise-clearance was given by the airports of London and New York to permit the operation of scheduled services; (5) the Comet was put into transatlantic passenger service simultaneously in both directions. Here is a brief diary of six momentous days:—

Monday, September 29. The Minister of Transport and Civil Aviation, on the recommendations of the Air Registration Board, issued the Comet 4's Certificate of Airworthiness. B.O.A.C.'s date for the inauguration of passenger services was officially "before the beginning of December," and unofficially—so it was rumoured—November 14.

Tuesday, September 30. On the day specified in the contract signed in February 1955, the first of 19 Comet 4s, G-APDB, was handed over complete with C. of A. to B.O.A.C. in a ceremony at London Airport, having arrived from Hatfield at 12.30 p.m. A second Comet 4, G-APDC, was actually delivered also, having arrived earlier that morning (pictures below). B.O.A.C.'s chairman said "a certain amount of shake-down flying will have to be done with each of them, of course, before we use them in service—then we shall be ready to go. . . . I do not wish to give a firm date for the introduction of the Comet 4 into service . . . but I assure you that we shall put it into service the moment we are ready to do so. . . . In two days' time we shall start proving and training flights between London and New York."

Wednesday, October 1. A third Comet 4, G-APDE, was delivered to B.O.A.C. It was confirmed by Pan American that a Boeing 707 would be making its second visit to London for noise tests, arriving on Friday, October 3. B.O.A.C. hurriedly postponed an invitation to the technical Press to accompany a proving flight to New York on October 2, and at a few hours' notice invited representatives of the national daily and Sunday Press to accompany the flight, which was described as "a pre-inaugural proving flight." Still no date for the start of services was given, and no indication of the reasons for the apparent sudden change of plans.

Thursday, October 2. Comet 4 G-APDB, commanded by Capt. T. B. Stoney, manager of B.O.A.C.'s Comet Flight, and with the managing directors of B.O.A.C. and de Havilland (Mr. Basil Smallpeice and Mr. Aubrey Burke) and the national Press on board as well as two crews, left London Airport at 12.30 hr local time on its "pre-inaugural proving flight" to New York via Gander. En route, 500 miles from New York, the captain exchanged courtesies with a Pan American 707 on its way to Rome via Goose, Prestwick and Shannon. At New York Mr. Basil Smallpeice was quoted as saying that he hoped to receive noise-clearance from the Port of New York Authority for the operation of scheduled Comet services from Idlewild. (The Comet 4 had made its final noise-clearance tests at New York on August 10, but no approval had up to that moment been granted.) Still no date for the start of services.

Friday, October 3. The Port of New York Authority cleared the Comet (and the 707) for scheduled services, with conditions (see page 571). In New York Pan American issued a statement, which was commented on by Mr. Smallpeice as showing a "lack of good sportsmanship" (see also page 571). Then B.O.A.C. announced that transatlantic Comet 4 services would begin simultaneously in both directions the following day, and last-minute efforts were made by B.O.A.C. to advise the many people who had long-standing bookings for the first Comet service. Meanwhile, the Boeing 707 arrived at London via Rome and Paris for its second series of noise tests.

Saturday, October 4. The Comet 4 entered service. At 12.01 B.S.T. (07.01 local) G-APDB, Capt. T. B. Stoney in command, and with Mr. Smallpeice on board, took-off from New York with 28 passengers (five fare-paying) and 16 staff-members and flew non-stop to London in the record-breaking time of 6 hr 12 min at an average speed of 565 m.p.h. (tailwind component: 90 m.p.h.).

Meanwhile from London Airport, at 0955 hr B.S.T., Comet 4 G-APDC (Capt. Millichap) had taken-off on the first scheduled jet service to New York. On board was the chairman of B.O.A.C., Sir Gerard d'Erlanger, and 31 passengers (eleven fare-paying). The flight took 10 hr 20 min, including a 1 hr 10 min refuelling stop at Gander. Messages were exchanged between Sir Gerard in DC and Mr. Smallpeice in DB en route.

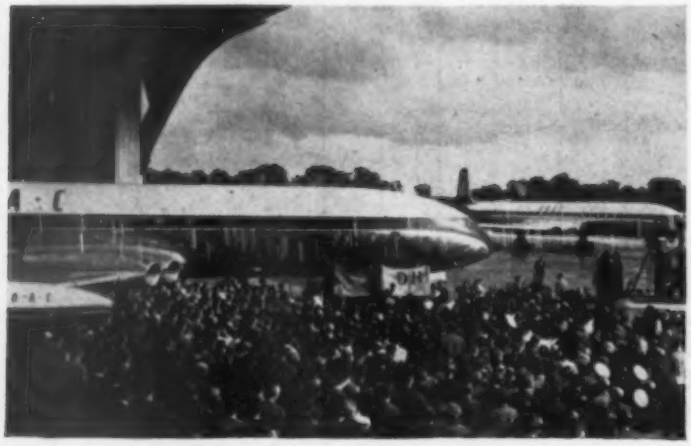
The Comet was back in business, and the race which officially had never existed had been convincingly won.

* * *

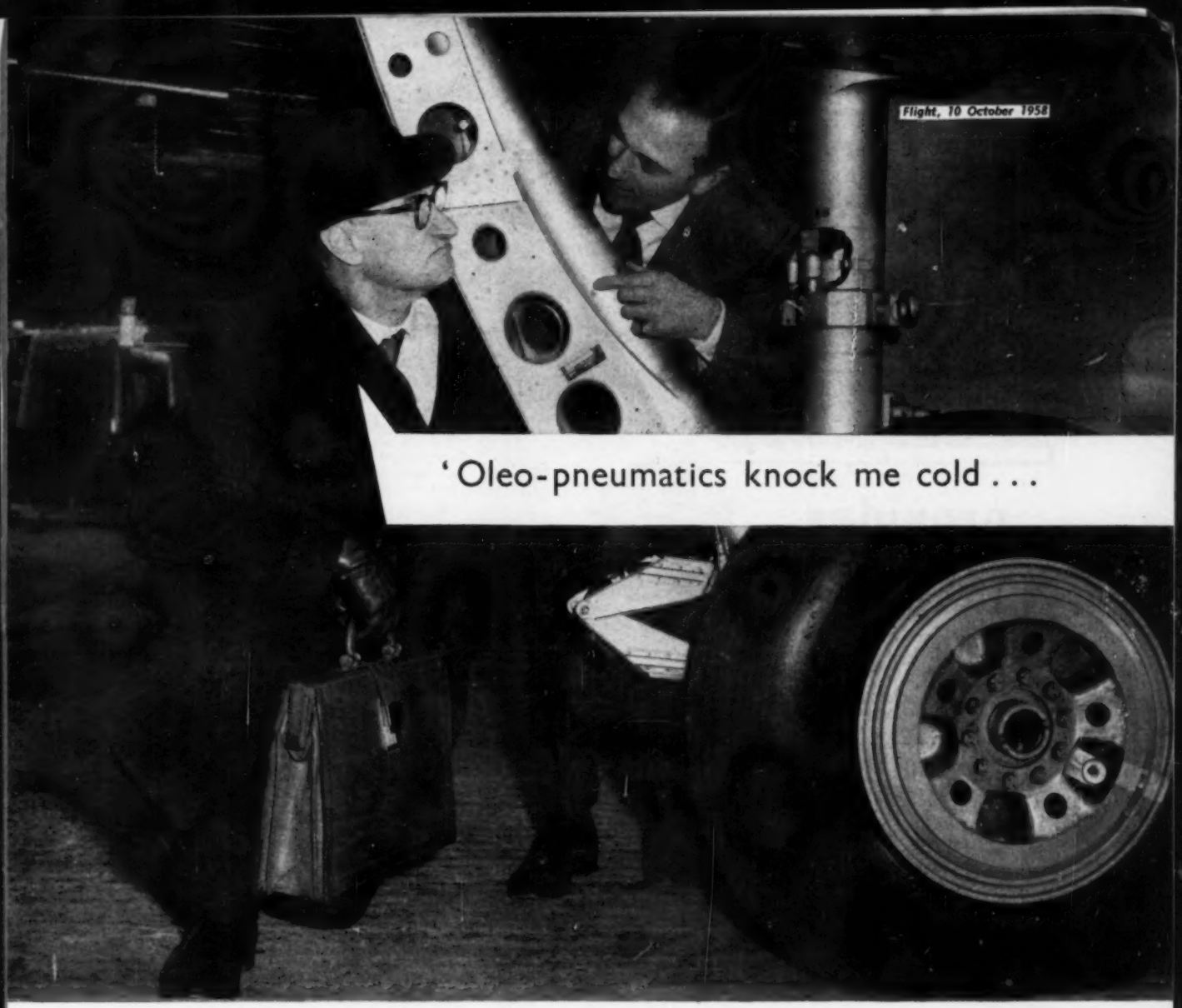
For the immediate future, Comet 4 services will leave London on Fridays at 1015 hr local time, returning from New York on Sundays, departing at 10.00 hr local. Westbound schedules are 10½ hr (1½ hr less than the Britannia's) and eastbound schedules are 6¼ hr (3¼ hr less than the Britannia's).

"By Comet 4 to New York," page 571; leading article, page 569; "Straight and Level," page 605.

"Flight" photographs



September 30, 1958: At London Airport Mr. Aubrey Burke holds the Comet 4's C. of A., which Sir Geoffrey de Havilland (centre) subsequently handed over to Sir Gerard d'Erlanger (right). Two aircraft were delivered on this day.



'Oleo-pneumatics knock me cold . . .

let's get back to operating figures'

When the airline accountant gets technical, he prefers to talk in terms of capital costs, air mile costs, seat mile costs, and profit margins.

From this point of view the Viscount 810/840 will delight him. Its initial cost is 50% less than any other 4-engined turbo-prop available. As air mile costs are the same as earlier Viscounts and the seating capacity greater, seat mile costs are lower.

Higher cruising speed and the high payloads customary with Viscounts, will ensure profitable operation on all medium-haul routes. The new Viscount 810 already has a cruising speed of 365 m.p.h. Changeover to more powerful Rolls-Royce Dart engines in 1960 will give 400 m.p.h. cruising.

The success of Viscounts is based on two important facts. Passengers prefer them—and they produce healthy airline balance sheets.

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FOUR ROLLS-ROYCE DART PROPELLER-TURBINE ENGINES

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PAL 10

HIGH OUTPUT FUEL FILTERS

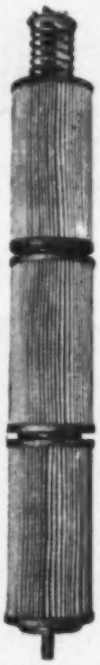

Fig. 1

A new Stream-Line development to extend their range of aircraft refuelling filters

Stream-Line filters (types K and PM) are well known for high efficiency and absolute reliability for the removal of solids and traces of finely dispersed water at the point of actual fuelling into aircraft.

To meet the demand for a filter of much greater capacity in applications where removal of solids only is required, a new filter element has been designed using a specially developed impregnated paper in deeply pleated form through which the fuel is passed actually between the individual *fibres* of the paper (Fig. 1) instead of between consecutive papers as in the standard K and PM 'edge' type elements (Fig. 2). *Our engineers will be pleased to discuss this filter with you.*

Fig. 2

* The 400 G.P.M. filter is only 20" diameter & only 32" long. The 1,000 G.P.M. filter is only 36½" diameter & only 40" long.

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SF/21

CIVIL AVIATION . . .

The inaugural service of Nigerian Airways W.A.A.C. left London for Lagos on October 1. The aircraft, a Stratocruiser chartered from and operated by B.O.A.C., was seen off by the Nigerian ministers who were in London attending the independence talks.

IRISH FRIENDSHIPS

THE first Fokker-built F-27 Friendships are due for delivery to Aer Lingus later this month and are scheduled to go into service on the Dublin - Paris route on October 31. (Deliveries of Fairchild-built F-27s are already under way.) Elapsed time allowed for the Friendship is 15 minutes longer than that for the Viscount, from which the new aircraft will take over the thrice-weekly Aer Lingus service.

The first of the second batch of Viscount 808s (EI-AKL/M/N) is due for delivery at the end of this year. When they are in service, Aer Lingus plan to sell the four V.707s which have given yeoman service since April 1954. The fleet of Douglas DC-3s, now ten in number, will be reduced by a half when the full quota of Friendships is delivered.

Meanwhile the Aer Lingus livery is being modified to emphasize the association with Aerlinte, and the shamrock is back after an absence of nearly three years. The revised marking (at present only on the Viscount 808, EI-AJK) consists of a white fin and rudder with a green-and-white-striped horizontal band. On the fin portion a green shamrock is borne on a white disc, while the tricolor of the Republic of Ireland has been moved to the upper part of the rudder. The registration remains on the fin as before, but in black letters instead of white.

In the bazaars of Dublin it is rumoured that 1959 will bring Oslo and Lisbon within the orbit of Aer Lingus/Aerlinte - Irish Air Lines operations.

I.A.T.A. TECHNICALITIES

THE greatest apparent value of technical conferences within the compass of I.A.T.A.'s 77 member-airlines is that a wealth of international experience can be brought to bear. In practice, the real foresight that stems from a lengthy background of operational development is probably concentrated among the countries bordering the North Atlantic, and it is from these that the main contributions to progress are both sought and obtained. But conferences are for learning as well as teaching, and the 400 representatives who attended I.A.T.A.'s eleventh technical conference at Monaco in September digested and appraised contributions from 36 airlines, national and international government agencies, defence forces and manufacturers of 29 nationalities before presenting a solid front of recommendations for jet-aircraft operation.

"The vanishing airspace" was, inevitably, a major topic in the conference agenda and the elimination within the next five years of "see-and-be-seen" in favour of positive control the recommended palliative. Long-term recommendations were that (1) the boundaries of flight information regions should be based on route-structure configuration and *not* on national boundaries; (2) a greater measure of freedom of operation should be allowed to all users of airspace below a certain level not required for public transport operations; (3) routes established within controlled airspace should permit a greater choice of routings and separation; and (4) the co-ordination between civil and military units, incorporating the expanded use of appropriate radar facilities and communications links, should be improved.

Certain steps for the immediate improvement of traffic control, the conference agreed, could be introduced immediately. These were that (1) all high-speed, high-flying aircraft must comply with instrument-flight rules; (2) there must be no relaxation of these rules, regardless of weather conditions; (3) below the airspace in which these aircraft operate, an I.F.R. flight plan shall be filed for each flight; (4) pilots will not cancel such flight plans, nor make use of I.F.R./V.M.C. when in level flight; and (5) "right-of-way" rules must be replaced by both aircraft in proximity giving way.

Other points from the discussion covered aircraft maintenance and overhaul, turbine engines, instruments, and approach and landing. Interest was expressed in obtaining longer initial inspection periods for new aircraft being introduced. To reduce turn-round times it was proposed that electronic rapid check-out systems, similar to those used with missiles might be employed and that, to provide pools of ready spares, more central depots could be established by manufacturers. It was also suggested that co-operative agreements between airlines might be introduced for carrying spare engines.

Better instrumentation was demanded for civil turbines, so that trouble-shooting can be carried out in the cockpit (a small percentage loss in power, for example, can produce a disproportionate increase in fuel consumption). An airborne vibration indicator was hoped to be of considerable economic value in facilitating maintenance and reducing en route delays. I.A.T.A. airlines are asking engine manufacturers to investigate alternatives to water injection for power augmentation in future engine designs.

The meeting also asked I.A.T.A. strongly to recommend that fuel suppliers take a "hard second look" at their fuelling procedures and equipment, because water- and dirt-free fuel is of major importance in gas-turbine fuel systems. Flowmeters and quantity gauges in aircraft should in all cases indicate fuel weight; the airlines said that they were prepared to go to great lengths to achieve an even more accurate knowledge of fuel weight on board than they had done hitherto.

In the discussion on take-off and landing two important automatic aids were reviewed. First, a take-off monitor for jet aircraft has now been produced and flight-tested as the result of an I.A.T.A. requirement. It was proposed that the relative merits of the various designs of instrument should be assessed by a specialist I.A.T.A. group. Secondly, encouraging reports of progress in landing aids were given to the conference by the Blind Landing Experimental Unit of the Ministry of Supply and the Bell Aircraft Corporation. Both have extensively flight-tested fully automatic landing systems. Although they are not yet developed in the best form for civil operations, the conference agreed that it may only be a few years before aircraft may be landing as a matter of course on the foggiest nights.

To commemorate the achievement of flying the first Viscount to 10,000 hr, a plaque was recently presented by Vickers to T.A.A. The recipient (right) was Mr. J. P. Ryland, the airline's general manager. Making the presentation was Mr. A. W. Millson, of the Vickers-Armstrongs Australian company. The aircraft was Viscount 720 registered VH-TVE.

BELGIUM'S PROFITABLE AIRLINE

SABENA'S report for 1957 was released at the annual general meeting held in Brussels on October 1. Financially the year was successful, total revenue rising to B.Fr3,063m, and net profit standing at B.Fr56m after allowing for B.Fr26m tax. Although rather lower than in 1956 (B.Fr77m after payment of B.Fr45m tax), last year's profit figure was reached after a sharp increase in the amount set aside for amortization (from B.Fr202m to 377m).

This improvement was not a reflection of more efficient operation: The level of operating costs rose slightly to B.Fr15.6 per capacity tonne-km (39d per c.t.m.), average load-factor fell from 74 to 72 per cent, and average revenue per load-tonne-km was diminished. But these damaging trends were outweighed by an increase in miscellaneous revenue from B.Fr93m to 213m (regrettably, this item was not shown in detail).

An outstanding feature of the year was that African operations accounted for less than half of Sabena's overall activity. In recent years services to Africa and within the Congo have represented an increasing proportion of the airline's operations, but in 1957 the expansion in other fields was so rapid that African traffic was only 48 per cent of the total (57 per cent in 1956). The remaining traffic was divided fairly equally over the North Atlantic routes (on which last year's increase was 54 per cent) and on the Europe and Middle East routes (traffic increase 48 per cent).

S/L. H. G. Hazelden, H.P. chief test pilot, "points out to Sir Frederick Handley Page" (we quote the picture-agency caption) "on a model of the Dart Herald the engine that caught fire and caused the crash landing." Mrs. Hazelden and her daughter Valerie, also in the group, saw "Hazel" presented with a gold watch in recognition of his skill in landing the aircraft without loss of life.

CIVIL AVIATION . . .

CRISIS IN CAMBRIA

SUSPENSION of all winter services by Cambrian Airways provides a dramatic example of the effects of a revenue short-fall and of credit restrictions on a small company whose operations have hitherto been distinguished by rapid expansion.

Over the last five years Cambrian have been used to an annual traffic increase in the order of 50 per cent. Seen against this background, their forecast of a 15 per cent increase this year implied a slowing-down in the growth-rate. In the event, this has proved to be quite unrealistic: traffic has fallen by a tenth.

Nearly all this decline has occurred in the Channel Island services, which last year accounted for about two-thirds of Cambrian's total traffic (i.e., 40,000 passengers out of a total 58,000). By mid-August only 8,000 had used these services.

Cardiff - Paris services were also badly hit, traffic by mid-August having reached 1,100 passengers—a fall of 25 per cent over the corresponding period last year. Belfast traffic (1,000 passengers by mid-August) dropped by 5 per cent. But these two losses were offset by a 50 per cent increase in Manchester traffic (1,800 passengers).

When expenditure starts to run ahead of revenue, as must have been the case with Cambrian this summer, it is usually necessary for a small organization to resort to borrowing if it is to remain intact. As a private company Cambrian publish no accounts, but it can be assumed that after having taken most prudent advantage of trade creditors and bank loans they still found it necessary to approach the shareholders. Sale of the Heron fleet and suspension of winter services suggests that their shareholders are at present reluctant to invest further in the airline.

The airline's joint managing director, W/C. L. B. Elwin, has stated that "we hope to resume operation next spring." But with only two DC-3s (by no means an entirely suitable fleet for Cambrian's network), the level of operations would probably be even lower than in this year.

Municipal authorities, particularly those at Cardiff and Bristol, are highly perturbed at the effect of this reduction on their local airports (Bristol have invested £¼m in Lulsgate during the past year or two) and—on a broader plane—on their local industries. The recently formed Welsh Development Corporation (of which Sir Miles Thomas is chairman) has been stressing good communications as an inducement to new industry.

In the years when Cambrian was doing well the value of regular air services was perhaps taken for granted. Now that misfortune has struck, the need to establish a firmer basis for operations can be seen. It seems that those standing to gain from the airline's continued existence will have to come forward with offers of financial help or, alternatively, a less vulnerable route structure must be developed. There is possibly a strong case for concentrating on week-day services to cater for business travel, rather than for expanding the week-end holiday market. There is still no London - Cardiff air service.

BREVITIES

SWISSAIR have ordered five Convair 880s, two of which will be leased to S.A.S. Meanwhile, S.A.S. have increased their Caravelle order to 16, four of which will be leased to Swissair. Joint maintenance arrangements have been made for all the jets ordered by both airlines.

* * *

Mr. E. R. Queseda has been appointed Administrator of the recently formed Federal Aviation Agency.

* * *

Representatives of seven local councils in the London Airport area have complained to the M.T.C.A. about smoke emitted by the Boeing 707 at take-off.

* * *

Air Jordan and Arab Airways were merged on October 4 and will be known as Jordan Airways. Chairman of the new company is Abd Al-Muti Al-Qutub.

* * *

A faulty auxiliary drive-shaft in the starboard engine is stated to have been the primary factor behind the crash of the first Dart Herald prototype on August 30. The second prototype is due to fly at the end of this month.

* * *

President Eisenhower's Air Co-ordinating Committee has sponsored an international conference, due to be held this week in Washington and Minneapolis, to discuss air navigation problems. The major item on the agenda is the relationship of the U.S. domestic system (VORTAC) to international navigation requirements.

* * *

An American source reports that Bristol have a project for a short-range jet transport seating 58 passengers and powered by four Bristol Orpheus. Meanwhile *American Aviation* suggests that the Douglas DC-9 short-range-jet project is still alive: latest specification is for 72 passengers, 2,000 miles' range, 125,000 lb gross weight, and powered by four P. and W. J52s. First flight would be in 1961 and delivery in 1962.

*

On September 25 the Minister of Transport and Civil Aviation, Mr. Harold Watkinson (second from left), visited White Waltham to watch a flying demonstration of the Fairey Rotodyne.

Next year's session of the I.C.A.O. assembly is due to be held at San Diego, California, beginning on June 16.

* * *

Austrian Airlines plan to start Viscount services between Vienna and Warsaw on November 1.

* * *

No trace has yet been found of a Middle East Airlines' York freighter that disappeared while flying between Beirut and Rome on September 29.

* * *

B.E.A. have appointed Mr. T. H. Pollock as their manager in Malta and North Africa. Sir Edward Moore is to succeed Mr. Pollock as the Corporation's manager in Belgium.

* * *

The Institute of Transport's 1959 Brancker Memorial Lecture will be given on April 13 by Capt. E. V. Rickenbacker, chairman of Eastern Air Lines. His subject will be *World Peace Through Air Transportation.*

* * *

A new version of the Tu-104, designated Tu-104B, is soon to enter Aeroflot service. Fuselage is lengthened by four feet, providing accommodation for 100 tourist passengers. Flaps of increased chord are fitted; power and general performance remain unchanged. Emphasis is on cargo capacity, the passenger floor having been raised. Maximum payload is now quoted as 12 tons, compared with the eight tons of the Tu-104 and nine tons of the Tu-104A.

Straight and Level

"WE signed a contract three-and-a-half years ago for 19 Comet 4s. The first one was to be delivered, complete with its Certificate of Airworthiness, on September 30, 1958. Well, here it is: and for good measure we have delivered another one."

This was said on September 30, 1958, by Mr. Aubrey Burke, managing director of de Havilland Aircraft, when he handed over the first two Comet 4s to B.O.A.C. at London Airport.

I do not suggest that the world should marvel when a British aircraft firm does what it contracted to do. But it is worth recalling that in 1948 de Havilland said that the Comet would enter service in the spring of 1952. It did; and furthermore, B.O.A.C.'s first Comet 1 was delivered with its Certificate of Airworthiness on February 4, 1952—six months ahead of the contract date.

● On the subject of target-dates, a recent M.T.C.A. Civil Aviation Information Circular advised pilots that the first birds of the winter migration would arrive at the Severn Wildfowl Trust "on or about September 24." Sure enough they did, and the world will never cease to marvel that his should be so.

● Apparently the Comet is now a symbol of British sport. B.O.A.C.'s managing director, Mr. Basil Smallpeice, was quoted as saying that PanAm were "lacking in sportsmanship" about the Comet. And the *Sunday Express*, in a leader about America's defeat of the British yacht *Sceptre*, said that we must not be too downhearted about this "terrible reverse for British sport": we could always console ourselves with the achievements of Bannister, Hawthorn and Moss, Pat Smythe, Donald Campbell—and the Comet.

● Ten out of ten to the air correspondent of the *News Chronicle*, who quoted Damon Runyon: "If this is not a race it will do until a race comes along."

● And to the *Daily Telegraph*, which said in an editorial: "It is as well to remember that civil aviation is not a sport concerned with making and breaking records. It is a commercial industry primarily concerned with making profits."

● By all means call something by a code-name when the true designation is unknown; there really is a case for Fishpot, Faceplate, Fishbed, Backfin, and all the rest of the new Russians. But why must we call the Yak-11 "Moose"? What's wrong with Yak-11?

There are about twenty sets of meaningless names which have been given to Soviet aircraft whose real designation is known perfectly well. I find them confusing; I am still not sure whether the Il-28 is the Butcher or the Beagle.

● Advertisements at the back of magazines are frequently directed at men over 40. Even *Flight* carried one a few weeks ago, in which the Air Ministry solicited applications for the post of Head of the Air Historical Branch and Librarian. Is it considered that, thus mature in years, he will be less susceptible to the allurements of the sirens who splash in the waters of the typing pool?

"O.K., it's all yours." Most of us have seen pictures of the American Thor IRBM being accepted by No. 77 Strategic Missile Squadron of R.A.F. Bomber Command near Feltwell, Norfolk. Here, summing up all the implications of British-based, British-operated American ballistic missiles, is what we *didn't* see—the brick-wall from behind which U.S.A.F. instructors watched the proceedings.

● The woman bomb-hoaxer who was recently caught in the act was fined £10 for causing "annoyance and inconvenience."

This does not appear to have deterred other hoaxers: anonymous telephone calls continue to be received at London and other airports with undiminished intensity, seriously disrupting air services and causing untold vexation to the airlines and their customers.

And so it will go on, until the law smacks down very much harder. In America the maximum penalty for bomb-hoaxing has just been increased to a fine of £1,800 *and* prison for five years.

● I was glad to see that Mr. Jim Matthews, a trade union leader I greatly respect, urged B.O.A.C.'s maintenance engineers not to prejudice the introduction of Comet 4 services. For one moment it appeared that the 4,000 engineers, who want more money, were putting pressure on B.O.A.C.'s management by threatening a strike on the eve of Comet services.

It could well be—as one union official explained—a "coincidence" that the threat of a strike, and a ban on overtime, came at such a critical moment. (It could well have been a coincidence, too, that the introduction of B.O.A.C.'s Britannias 18 months ago was similarly threatened by a last-minute strike of the flight engineers.) But I imagine that very few people would have felt much sympathy for the engineers' claim had the Comet been held to ransom.

Introduction of newer, more productive aircraft is certain to bring many labour problems. In America a tremendous battle is being fought out between airline managements on the one hand and pilots and flight engineers on the other—*and* between the pilots and the flight engineers. I appreciate the basic cause of these troubles—higher productivity tools always tend to cause redundancies of labour. But I do not understand the argument that when managements put more efficient tools into your hands they should automatically pay you more money for using them. Senior American airline pilots, who average about £7,000 a year, are now demanding up to £16,000 a year for flying big jets. Why?

● Boy, those American news-releases really go! If only British P.R.O.s would get with Lockheed's style:—

"The Middle East crisis proved the foresight of the Air Force-Army team that developed the six-miles-a-minute Lockheed C-130 Hercules prop-jet airlift giants . . . Stubby-nosed, 62-ton work-birds . . . 'Strongmen of the Airlift' . . ."

The release goes on:

"One frantic pilot told an Air Force photographer: 'Please take my picture in front of the sign that says Adana, because my wife thinks I'm in Long Beach, California, and she will never believe me when I tell her where I've been.'"

Meanwhile, from Douglas comes news that the thousand DC-6/7 transports built to date would, "when lined up wing-to-wing, extend for more than 24 miles."

While I find this kind of so-what information hard to reconcile with the maturity of the firms concerned, I must add that the standard of American information services is generally very high. For example, I was recently shown a release from New York Airways in which a blank space was left for "hot" traffic figures: this was filled in by hand at the last moment before airmailing.

● The magic of a name, they say. But what about the magic of a number? Or a technical term? Or a symbol? Take the Britannia. Build it at Bristol and call it a 300, and 130 bodies is a high-density load. Build it at Belfast, paint roundels on it and call it a 250, and the same number of bodies becomes a low-density load. Marvellous, isn't it?

● *Member of the public to D.H. spokesman:* "Now about this Comet of yours. How many people have you got behind it?"

D.H. spokesman: "Forty million."

ROGER BACON

SERVICE AVIATION

Royal Air Forces and Naval Flying News

One of the two R.N. Whirlwinds carried in H.M.S. "Protector," which sailed for the Falkland Islands last Friday on guard-ship duties. Painted orange and black, the helicopters are equipped with U.S.-manufactured flotation gear for use in emergencies.

Exercise Sunbeam

THIS year's major U.K. air defence exercise—code-named Sunbeam—is to start next Thursday and will continue until October 20. Directed by the A.O.C-in-C. Fighter Command, Air Chief Marshal Sir Thomas G. Pike, its purpose is to test the country's air defences under conditions to be expected in the early stages of a nuclear war.

Raiding aircraft will be provided by Bomber and Flying Training Commands, the F.A.A., U.S.A.F., Belgian and Netherlands Air Forces and 2nd and 4th A.T.A.F.s; and during the exercise there will be a "fall-out" phase—Exercise Night Bird—when the R.O.C. and the U.K. Warning and Monitoring Organization will operate in support of the air defence system.

Senior Appointments

THREE new appointments to senior posts have been announced by the Air Ministry. A.V-M. W. P. G. Pretty, who has been A.O.A. at 2nd T.A.F. headquarters since April 1955 and was previously Director of Electronics Research and Development (Air) at the Ministry of Supply, became Director-General of Organization from last Tuesday; A.V-M. H. A. V. Hogan, previously A.O.C. No. 83 Group, 2nd T.A.F. (from August 1955), and before that A.O.C. No. 81 (Fighter) Group, became S.A.S.O. at Flying Training Command on October 1; and A.V-M. J. F. Hobler, who has been A.O.A. at M.E.A.F. headquarters since July 1956 and was previously Director of Personal Services at Air Ministry, is to be A.O.C. No. 25 Group, Flying Training Command, from next Wednesday.

"With bayonets fixed and colours flying," units of R.A.F. Felixstowe march through Felixstowe on September 26, when the station—one of the oldest in the country—was given the freedom of entry to the town.

C.F.E. Commandant

FIRST Australian to win the V.C. in air operations, G/C. Hughie Edwards has been appointed Commandant of the Central Fighter Establishment from October 20 with the acting rank of air commodore. He is being succeeded as station commander at R.A.F. Habbaniyah by G/C. R. D. Stubbs.

G/C. Edwards was awarded the V.C. after a daylight low-level attack against Bremen on July 22, 1941. Three weeks previously he had won the D.F.C. for leading a bomber formation on a sweep against heavily armed enemy shipping off the Dutch coast, and he was later awarded the D.S.O. for leading a mass daylight raid on the Philips radio factory at Eindhoven in December 1942. G/C. Edwards graduated from the Staff College in 1947 and has commanded Habbaniyah since April 1956.

His successor there, G/C. Stubbs, has for the past two-and-a-half years been Deputy Director of Operations (Air Transport) at Air Ministry. He won the D.F.C. in May 1940 and later commanded Nos. 106 and 49 Sqns.

Admiralty Re-organization

UNDER an Admiralty re-organization started in January this year and completed on October 1, there are now four large material departments under the Controller of the Navy, each headed by a Director-General. One of these four, the Aircraft Department, will be responsible for ensuring that the Admiralty's air material requirements are met and that such material operates satisfactorily in service. Its work has been allocated to two divisions and two independent sections, an Air Equipment and Naval Photography Division and an Air Maintenance and Repair Division; and Air Armament and Air Radio Sections. The present Director-General, Aircraft, is Rear Admiral J. P. W. Furse; Capt. J. C. Cockburn heads the equipment and photography division and Capt. D. J. Hoare the maintenance and repair division.

October Reunions

TWO annual reunion dinners are being held in London on October 25. The 1914-1918 Nos. 7 and 14 R.N.A.S. and R.A.F. Handley Page Squadrons' Association is meeting at the Horse Shoe Hotel, Tottenham Court Road, W.1; and No. 2 A.D.U. (M.E.) at the R.A.F. Reserves Club, 14 South Street, W.1.

IN BRIEF

R.A.F. personnel on loan to the Iraq forces were officially informed on September 27 that they were to leave the country within one month.

* * *

The ban on military aircraft flying over the Sudan, imposed during the Middle East crisis in July, has now been partially lifted. This was announced recently in Khartoum.

A.V-M. P. D. Cracroft, who recently retired as A.O.C. No. 18 Group, is seen (below, left, in uniform) with his successor, A.V-M. A. D. Selway. This change of command was reported in "Flight" last week, page 563. Centre, Air Chief Marshal Sir Basil Embry sees the work of No. 1 Control and Reporting Unit during his visit to R.A.A.F. bases in New South Wales; on his right is A.V-M. C. D. Candy, A.O.C. Home Command, R.A.A.F. Below right, A.V-M. W. R. MacBrien, head of the R.C.A.F. Air Defence Command, with Maj-Gen. E. H. Underhill, commander of the U.S.A.F. Eastern Air Defence Force, during a recent rocket shoot at Cold Lake, Alta [see "Flight," August 22].

Correspondence

The Editor of "Flight" is not necessarily in agreement with the views expressed by correspondents in these columns. Names and addresses of writers, not for publication in detail, must in all cases accompany letters.

Certification Photo-finish

TO clarify the situation for *Flight* readers—particularly those who may be chroniclers of aviation—I would like to point out that the Electra (rather than the Eland-Convair) holds the distinction of being the first turbine-engine aircraft designed and manufactured in the United States to be fully certificated by the Civil Aeronautics Administration.

I am not aware of *Flight's* sources of information, but the statements contained in two recent news-items ("C. of A. for the Eland-Convair" and "Certification for the Electra") aroused my curiosity, for they differed somewhat from Press releases published here on the West Coast.

Accordingly, a telephone conversation with a spokesman for Region IV of the C.A.A. (under whose jurisdiction both aircraft were certified) confirmed that indeed the Electra's Approved Type Certificate was awarded approximately one half-hour before noon of August 22, 1958. The Eland-Convair's A.T.C. was issued at about 1630 hours the same day!

This correction will be taken, I hope, in the spirit with which it is offered. With jet-age developments taking place in rapid-fire manner nowadays, consistent documentation should serve to avoid confusion in later years (*cf.* the "Cody Controversy" letters).

Granada Hills, California. KENNETH E. HODGE.

Flying-hour Records

ON the subject of flying hours achieved by pilots, I see that the record is thought to be held by Capt. O. P. Jones. May I respectfully submit for consideration the total of 23,600 hours achieved by W/C. R. H. McIntosh, one of the best-known pioneers of civil aviation and at one time Airwork's chief pilot? "Mac" is, of course, still with us and still flying—though in a purely private capacity now. As your readers will doubtless recall, he was a competitor in this year's national air races.

London, W.1. ELISABETH DE STROUMILLO,
Public Relations Officer, Airwork, Ltd.

Croydon as a Museum?

IT seems fairly definite that Croydon Airport will close at the end of the year. Amid the shower of suggestions for the future of this 400 acres of valuable land, I look in vain for a suggestion to preserve part of the airport, say the terminal building, the hangars, and the hallowed apron as a national aeronautical museum. I submit, Sir, that this solution would wholly satisfy those who say that flying from Croydon must cease—those unfortunate people who bought homes overlooking the field, and then sat back to complain about the noise of the aircraft. It would partially satisfy the other major faction at Croydon, the die-hard aviators who say that Croydon must be kept going at all costs.

Pardon my ignorance, Sir, but has Britain already got such a museum? If not, I think we owe it to our children to preserve for them, in one large centre, material evidence of the achievements of this country, which leads—present tense, please—the world of aviation.

Mitcham, Surrey. WHITE KNIGHT.

[The principal, much-discussed, and apparently insuperable obstacle to the establishment of a national aeronautical museum is a financial one.—Ed.]

Aviation Art

IN the course of opening the fifth annual exhibition of the Society of Aviation Artists, Sir Dermot Boyle remarked that more ought to have been done for the aviation arts during the past half-century. No one can disagree.

However, it might repay the Society to recover some of the paintings of former artists of the front rank and display them in a separate section of their annual show—later, maybe, to find a permanent home in a national aeronautical museum. There was quite a number of aviation artists: Geoffrey Watson, Joseph Simpson, Roderic Hill and latterly, of course, Leonard Bridgman, who happily is still current.

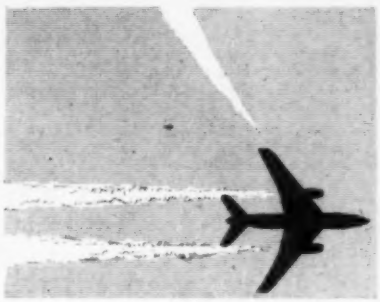
Geoffrey Watson held an exhibition of his works at the Brook Street Galleries in 1919 at least as large as that running at Guildhall today. I have a small watercolour of his of a D.H.9 raid by the Independent Air Force in 1918, and "Senrab" has a first-class one of a Bristol Fighter in action in that war. There must be many other survivals. Joseph Simpson's work as official air artist is to be found in the proper place, the Imperial War Museum.

Perhaps the picture is not quite as dark as painted by Sir Dermot, but everyone must agree with his sentiments about making up for lost time—and that not only in the field of aviation art. There are, for example, such things as the poor wrecks that have survived to remind us of previous generations of historical aircraft. I believe something is likely to be done to restore them to something approaching their original pristine finish, but as for painting S.E.5As in silver as authentic camouflage as a standard, all I can say is—Bah!

Woking, Surrey. C. F. ANDREWS.

Oddity at Odiham

AS a member of the Royal Observer Corps I would like to express my thanks to the R.A.F. for the excellent flying display and exhibition they laid on for the Corps at the "Open Day" at Odiham on Saturday, September 27. During the display a number of us saw a form of contrail which seemed most unusual. Weather conditions were good, with blue sky and sunshine and possibly slight high-level haze. A Destroyer came almost directly overhead, going towards the sun, contrailing normally, and then for about three or four seconds appeared to produce another "trail" practically at right angles on the starboard side. The impression was that it was spraying outwards. After some discussion we decided that it might have been a visible shock-wave. I have seen them clearly during a fast run by a Hunter at Farnborough in conditions of high humidity, but in that case they were much shorter and apparently touching the aircraft, and "flashing" on and off momentarily. Perhaps some other reader has seen this phenomenon and can explain its origin.



Visible shock-wave?

Tolworth, Surrey. T. N. SIMPSON.

Mrs. S.'s Diary

POSSIBLY some of your erudite readers can help me with this. My wife, an intelligent though aeronautically uninformed woman, from time to time in my absence sees the most remarkable aircraft around here; being interested she makes a sketch of them. About two months ago she positively saw what seems to have been very like a Vulcan but flying backwards, and yesterday she made a careful drawing of another delta-winged aircraft with no fuselage ahead of the wing but a long one behind it with an asymmetrical tailplane. No doubt about it at all.

Kew, Surrey. SKY SCANNER.

FORTHCOMING EVENTS

Oct. 10-12. Australian Women Pilots' Association: a.g.m., Sydney.
Oct. 10-11. College of Aeronautics, Cranfield: Open Days.
Oct. 11-12. British Women Pilots' Association: Flying Weekend, Ramsgate.
Oct. 14. Institute of Transport, Yorkshire Section: "Freight by Air," by M. G. K. Byrne.
Oct. 16. R.Ae.S. Graduates' and Students' Section: "The Fatigue of Aircraft," by Major P. L. Teed.
Oct. 16-17. British Interplanetary Society: Space Medicine Symposium and Twenty-fifth Anniversary Dinner.
Oct. 17. Fair Oaks Aero Club: Annual Dinner and Dance.
Oct. 20-29. AGARD meetings, Copenhagen.
Oct. 22. Kronfeld Club: a.g.m.
Oct. 23-24. AGARD Symposium, "Escape and Survival" (Copenhagen).
Oct. 23. British Institution of Radio Engineers (Scottish Section): "Flight Evaluation of Airborne Electronic Equipment," by H. G. Hinkley (at Glasgow; and at Edinburgh on Oct. 24).
Oct. 27. R.Ae.S.: "The Bloodhound," by D. J. Farrar.
Oct. 28-29. AGARD Assembly, Copenhagen.
Oct. 29. R.Ae.S. Graduates' and Students' Section: Annual Film Show.
Oct. 29. Kronfeld Club: "Aircraft at Leszno, 1958," by Peter Brooks.
Oct. 31. Surrey Flying Club: Annual Dinner and Dance.

R.Ae.S. Branch Fixtures:—Oct 13, *Glasgow*, Graduates' and Students' Section, Opening Meeting. Oct. 15, *Bristol*, Presidential Address; *Coventry*, "Digital Computers," by R. F. King. Oct. 20, *Glasgow*, "Propulsion Systems for Helicopters," by Dr. A. W. Morley; *Henlow*, "Guidance and Control," by L. H. Bedford. Oct. 21, *Luton*, "Fatigue Testing of the Fokker Friendship," by E. J. van Beek. Oct. 23, *Bristol*, film show; *Southend*, "Air Safety—Work of the Air Registration Board," by W. Tye. Oct. 29, *Hatfield*, "Recent Developments in Aircraft Casting Manufacture," by R. W. Eade; *London Airport*, brains trust; *Weybridge*, brains trust.

THE INDUSTRY

Wiggin Expansion at Hereford

THE firm of Henry Wiggin and Co., Ltd.—members of the Inco-Mond-Wiggin Group—have announced the completion of the first stage of concentration and modernization of their Hereford works. Built in 1951 for the Ministry of Supply as a strategic plant for the production of Nimonic alloys, the factory was purchased by Wiggin in 1956 with a view to concentrating all the company's production at Hereford. The first stage of what is to be a considerable expansion scheme is now complete for production melting and metal-recovery activities. Processing of ingots will, however, continue for a time at the Birmingham and Glasgow plants.

By 1965, when it is planned that the third and last phase of development will be completed, the works, laboratory and office blocks will cover approximately 25 acres and be fully equipped for handling an extremely wide range of extrusions, together with sheet and wire products for aircraft and industrial applications.

At the present time the plant can accommodate the melting and initial processing of the 100-odd standard Wiggin alloys, and the work is carried out in what is believed to be the most modern facility of its kind in Europe, and possibly in the world. The main production departments are laid out under one roof in a manner suitable for efficient flow production methods of working. A 5,000-ton Loewy extrusion press forms the backbone of the manipulative equipment, and ingots are fed to it after heating in four Wellman furnaces using town's gas.

One of the interesting developments in the production of rod and bar by the extrusion process is the use of Nimonic 90 alloy for extrusion dies, hitherto made in a 10 per cent tungsten alloy-steel. Particularly encouraging results have been obtained in the extrusion of Nimonic 100 in Nimonic 90 dies, and it is expected that the material will eventually be used for all extrusion dies. At the present state of development die-life varies between 30 and 50 extrusions when using the Sejournet technique of glass-wool lubrication. The majority of the materials extruded in this manner at Hereford are nickel-chromium and nickel-chromium-cobalt base alloys for high-temperature and corrosion-resisting applications.

Portable Cable-tester

FROM de Havilland Propellers, Ltd., Hatfield, comes announcement of the de Havilland cable-test set. It provides, in easily portable form, the necessary facilities for checking the continuity and insulation of multi-core cable looms. Although initially designed for checking electrical systems in aircraft, the unit should be of value in any type of installation where cabling is already in place, or where the cable runs are in confined spaces.

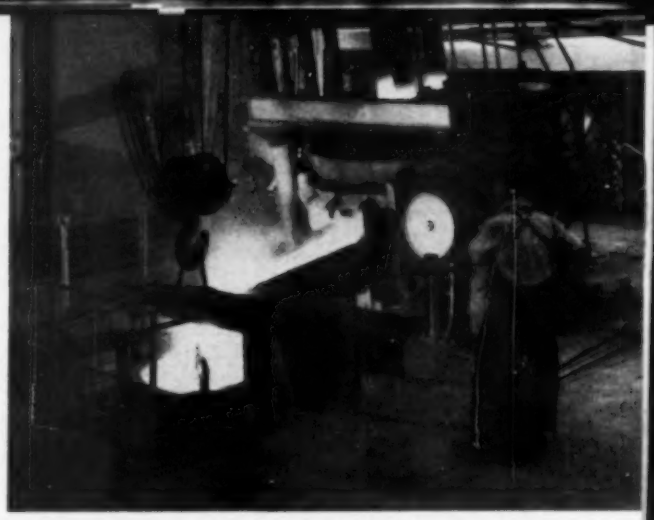
The D.H. cable-test set.

Both continuity and insulation checks can be carried out from one end of a cable run, the far end being terminated by a small unit weighing less than ½ lb. A test is initiated by a press button and the instrument automatically selects each wire in turn. Identification of the core undergoing test is indicated in a window which is illuminated by a red light if failure occurs, in which case the selector stops at the faulty core. Completion of a test sequence is indicated by the extinguishing of a separate indicator lamp. A reset button prepares the test set for a further test sequence.

To enable long cable runs to be tested in conditions where the termination unit is more conveniently attached by a second operator, an intercommunication amplifier is incorporated in the instrument, connection being made via the cable under test. Standard Service-type headsets may be used. When this system is in use the operators receive an additional audible signal as each test is made and can distinguish when a cable failure is detected.

Power is supplied by a lightweight battery of a type having no free electrolyte, and of sufficient capacity for about sixteen hours of normal use. A charging unit, incorporated in the transit case, can be supplied, or an A.C. power unit can be provided as an alternative to the battery.

Operating data include the following:—Speed of operation: on continuity, 5 conductors per sec; on insulation, 1 per 30 sec or 1 per 15 sec or 1 per 6 sec, as required. Insulation test voltage (non-lethal, by virtue of current limitation), 500 volts D.C. Connector capacity, up to 25 ways per set.



Pouring from one of the Birlec three-ton electrode furnaces at the new Henry Wiggin plant at Hereford. (See first news item.)

Plessey Rectifier Agreement

AN important licensing agreement is announced by the Plessey Co., Ltd. It covers the manufacture in Britain of silicon rectifiers for military and civil uses—including missile systems, computers and television sets—and has been concluded with one of America's leading silicon rectifier manufacturers, General Instruments Corporation, of New Jersey. The agreement provides for Plessey to receive production information on more than 200 types of silicon rectifiers. In addition, the British company receives British and West European manufacturing and sales rights in respect of rectifiers to General Instruments design. Plessey executives and engineers are now in America to study the processes adopted by General Instruments at their Newark, N.J., factory, and the latter company's specialists are visiting Britain to assist in the establishment of similar processes here.

IN BRIEF

Mr. R. W. Jelbart, T.D., M.N.I.H., A.S.M.A., has been appointed sales manager of the thermostat division of R. B. Pullin and Co., Ltd. He was formerly sales manager of Aga Heat, Ltd.

* * *

Mr. Roy F. Belcher, formerly with Decca Radar, Ltd., has succeeded Mr. Peter Allen as publicity manager of Desoutter Brothers, Ltd.

* * *

The European Division of Electronic Associates, Inc., at 43, Rue de la Science, Brussels, Belgium, announces the sale of a large general-purpose Type 231R "PACE" analogue computer to the Atomic Energy Research Centre at Harwell.

* * *

Mr. Leonard Kingsman, formerly publicity manager of the Bristol Aeroplane Co., Ltd., has resigned from Central News, Ltd. in order to join the Board of Norman Davis, Ltd., Princes House, Piccadilly, London, W.1. He will continue to specialize in the aeronautical and automotive fields.

* * *

A research and advanced development sub-division has been set up within the engineering division of Canadair, Ltd., Montreal, to provide a consultant service for the aviation industry and other clients. It is to be directed by Mr. B. J. Kaganov, previously assistant chief engineer for research and development.

* * *

Elliott Brothers (London), Ltd., announce that Mr. F. J. Shields, senior technical officer (instruments) in B.O.A.C., is joining them as service manager of their aviation division. Mr. Shields has experience of all aspects of instrumentation in commercial aircraft, including engine instrumentation, navigational equipment, autopilots, air data systems and complete flight control systems.

* * *

The first of B.O.A.C.'s four Mercury Airtug 160L tractors was delivered to London Airport by the Mercury Truck and Tractor Co., Ltd., of Gloucester, in time to be tried out with the Pan American Boeing 707 on September 8. [Airlines frequently use one another's ground equipment on a handling-agency basis.]

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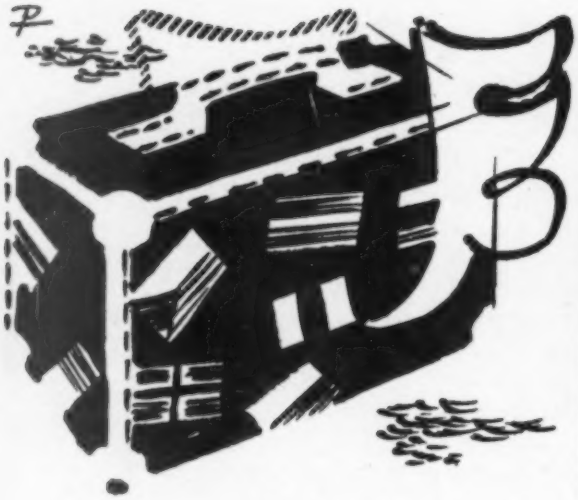

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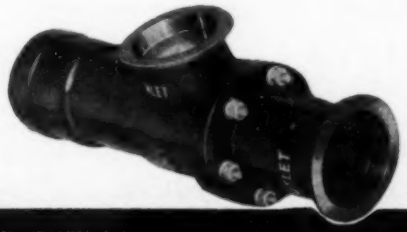
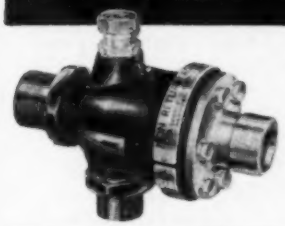
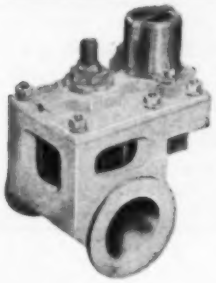
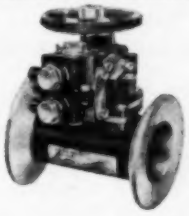


Godfrey Valves and Sensing units







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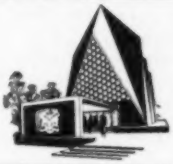

Brussels Exhibition

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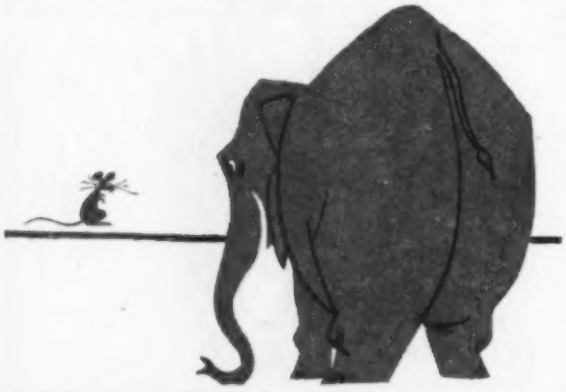

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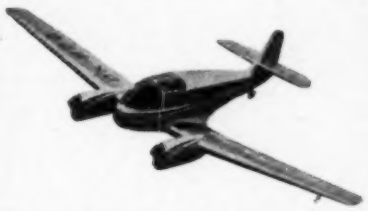

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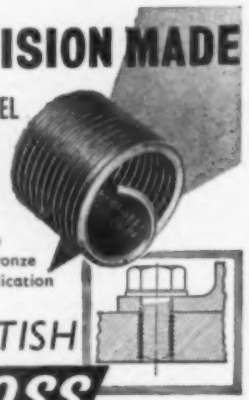

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NOTICE is hereby given that Claude Buchanan Morrison seeks leave to amend the complete specification of Letters Patent No. 715102 for an invention entitled "Improvements relating to Jet Propelled Aircraft."

PARTICULARS of the proposed amendments were set forth in the Official Journal (Patents) No. 3,633, dated October 1st, 1958.

ANY person may give notice of opposition to the Amendment by leaving Patent Form No. 36 at the Patent Office, 25 Southampton Buildings, London, W.C.2, on or before November 1st, 1958.

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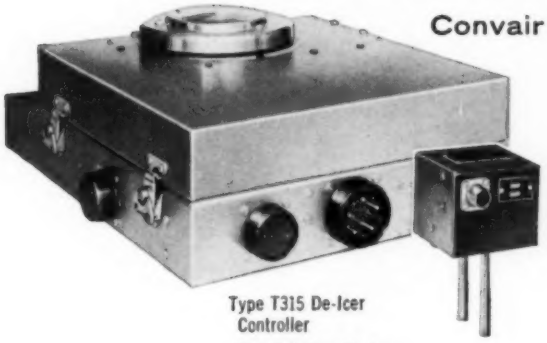

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